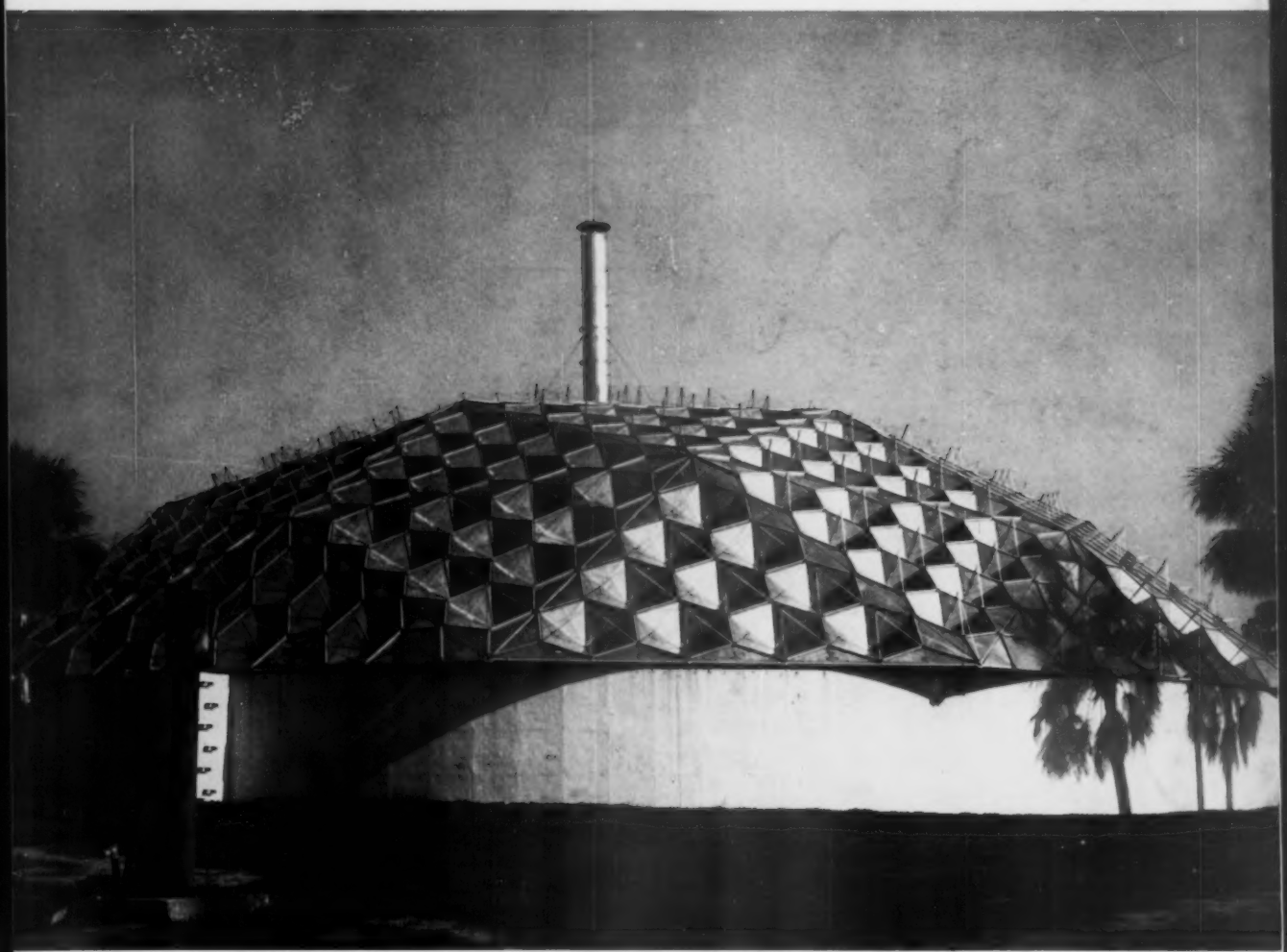
A Scranton Gillette Publication

APRIL 1959

WATER & SEWAGE WORKS

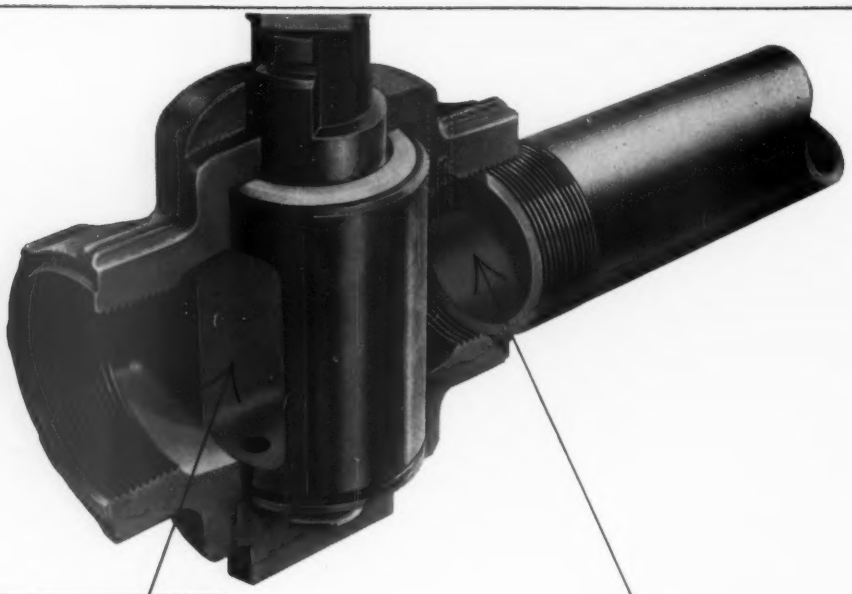
WATER SUPPLY • SEWAGE DISPOSAL



▲ **GEODESIC SPACE FRAME, covering trickling filter assures odor control by providing positive ventilation and venting of filter gasses to a high point, plus unique "eye-appeal." Article on page 143 also explains how major reduction in operating costs were obtained.**

Canadian Filter Plant—(p. 148)

Management Symposium—(p. 154)



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The shape and size of the rectangular ports of ACF Lubricated Plug Valves combine flow efficiency of the pipe with compact plug valve design.

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Four-inch F&P magnetic flowmeter measuring influent from the grinder at the Gainesway Subdivision Sewage Treatment Plant, Lexington, Kentucky. Accuracy is unaffected by piping configurations or valve placement. Consulting engineer: Marion C. Welch, Lexington, Kentucky.

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OBSTRUCTIONLESS . . . that's the big reason why more waste treatment plants are installing F&P magnetic flowmeters every day. No restrictions . . . no obstructions mean no clean-out problems whether you're metering raw sewage, effluent, or sludges. F&P magnetic flowmeters are even provided with built-in brushes for cleaning electrodes in a matter of minutes without shutdown.

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Vol. 106 No. 4

APRIL • 1959

A Scranton Gillette Publication

E. SCRANTON GILLETTE
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WATER & SEWAGE WORKS is published monthly with an extra issue in August. Subscriptions including the Reference Number issue in the U.S. and Canada, 1 year $5.00; 2 years $7.50; 3 years $10.00. Other countries $1.50 per year additional. Single copies 50c except Reference Number $1.00.

E. Scranton Gillette, President; George E. Symons, Executive Vice President; C. T. Gillette, Secretary; and H. J. Conway, Treasurer; M. B. Nylund, Vice Pres.

•

WATER & SEWAGE WORKS, Reg. U.S. Patent Off. Published monthly by Scranton Publishing Co., Inc., at 1600 N. Main St., Pontiac, Ill. Entered as second class matter at the post office at Pontiac, Ill., under Act of March 3, 1879.

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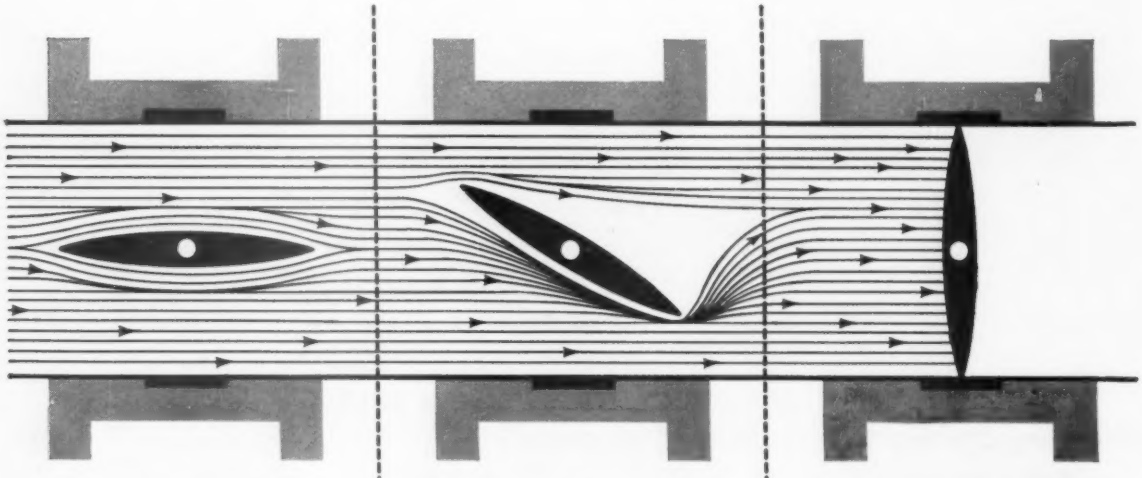
3 jobs a valve should do

The three functions of a valve are these ...
1 ... to provide free flow when open,
2 ... to control flow in intermediate positions,
3 ... to shut off completely when closed.
Not all valves can do *all* these tasks with equal efficiency, and in many cases, the installation of two valves in series has become an expensive and awkward compromise. Let's see how butterfly valves (as built by Henry Pratt) meet the three vital essentials:



FREE FLOW WHEN OPEN

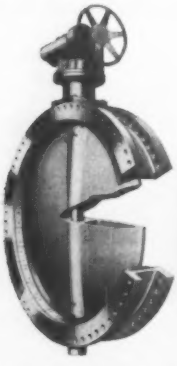
A lens shaped, streamlined valve disc offers the least possible resistance to flow. Actual head loss factor (K) in a fully opened low pressure valve is equal to 0.263, or only 60% of the loss through a 45° pipe elbow.

EFFECTIVE FLOW CONTROL

Flow characteristics of a butterfly valve are similar to those of a V-port plug valve, but with only ⅓ the head loss in the open position. Butterfly valves have a minimum to maximum controllable flow ratio (rangeability) of 25 to 1.

TIGHT CLOSURE

Closing smoothly into the seat, the disc squeezes into the rubber to obtain closure. Heavy rubber seat minimizes wear, assuring **continued** tight shutoff; corrosion resistant disc edge means valve will operate easily even after being closed for years.



Henry Pratt Low Pressure Rubber Seat Butterfly Valves are suitable for operating temperatures ranging from −20°F. to 190°F., and shutoff pressures ranging from vacuum to 50 psi.

HENRY PRATT RUBBER SEAT Butterfly Valves

If you would like more technical data on butterfly valves, write for the Henry Pratt Manual of Rubber Seat Butterfly Valves, B2B.

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Briefs

Geodesic Space Frames over trickling filter aided in solving the problem of odor control. First the raw sewage was diluted to reduce the hydrogen sulfide content, and the cover provided positive ventilation and permitted the venting of filter gases to a high point. A major reduction in operating costs resulted from these modifications—page 143.

Then is Now was the theme of the mid-winter meeting of the New York Section of AWWA, as Wendell R. LaDue discussed the water supply of the future, and Larry Daniel, spoke enthusiastically on the future of Cuba—page 147.

St. Romuald, Que., Filtration Plant reflects the latest in both modern design architecture layout and equipment from the panorama viewed through large windows facing the river to the colored terrazzo crest of the municipality at the bottom of the clear water basin. The plant has a nominal capacity of 1 mgd but can easily be expanded to 4 mgd—page 148.

AWWA Board Actions reports on the selection of officers for 1959, a review of the 1959 program of the Advancement Committee, and the latest action of the Certification policy—page 152.

Management Symposium—Part II covers three papers on fiscal matters. The profit motive, financing and earnings of a water company, and a water works manager's use of financial statements—page 154.

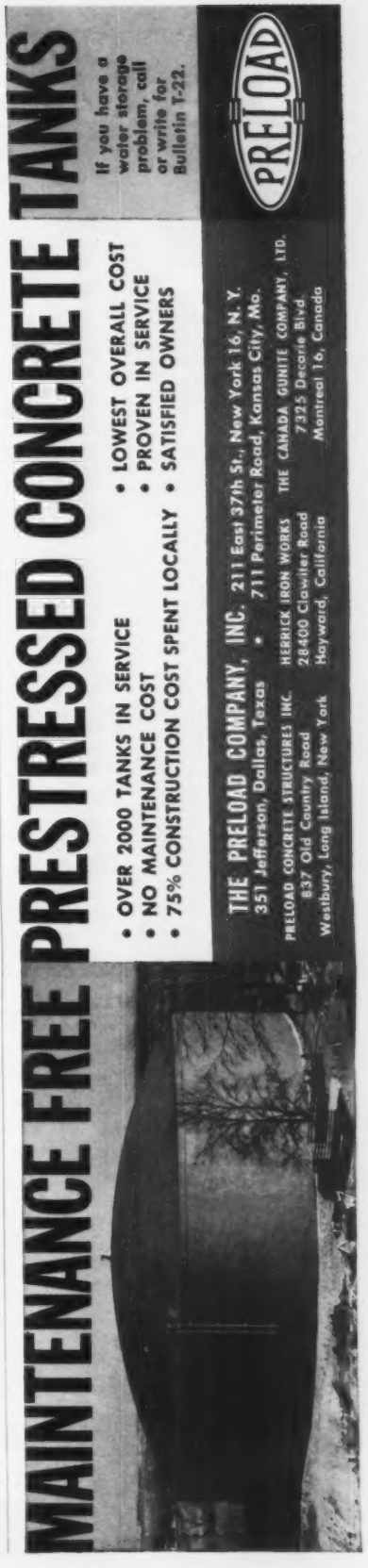
Sewage Plant Handles Industrial Wastes discusses how through surveying, ample testing and sampling procedures, plus the cooperation of industries can result in an economical plant operation—page 164.

Safety in Chlorine Handling relates principally to the psychological effects of accidental exposure to chlorine and the means by which these exposures and their effects can be minimized. This fourth of a series focuses attention on the emergency aspects of chlorine use—page 169.

Wastewater Technology in Germany is the first of two parts dealing with recent progress in sewage treatment techniques in Germany. Part I deals principally with primary sewage treatment—page 176.

N. Y. Sewage & Industrial Wastes Assn. meeting where Education, Methods and Evaluations of contemporary designs and approaches were reviewed. What formal education does a Sanitary Engineer need? How has municipal government changed? How are old methods adapted to new or better processes? Abstracts of papers on—page 182.

The Editor Comments on the recently announced plans of Harry Jordan to retire, and presents a brief review of "Mr. Water Works" career with the Association—page 184.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GOING IN...

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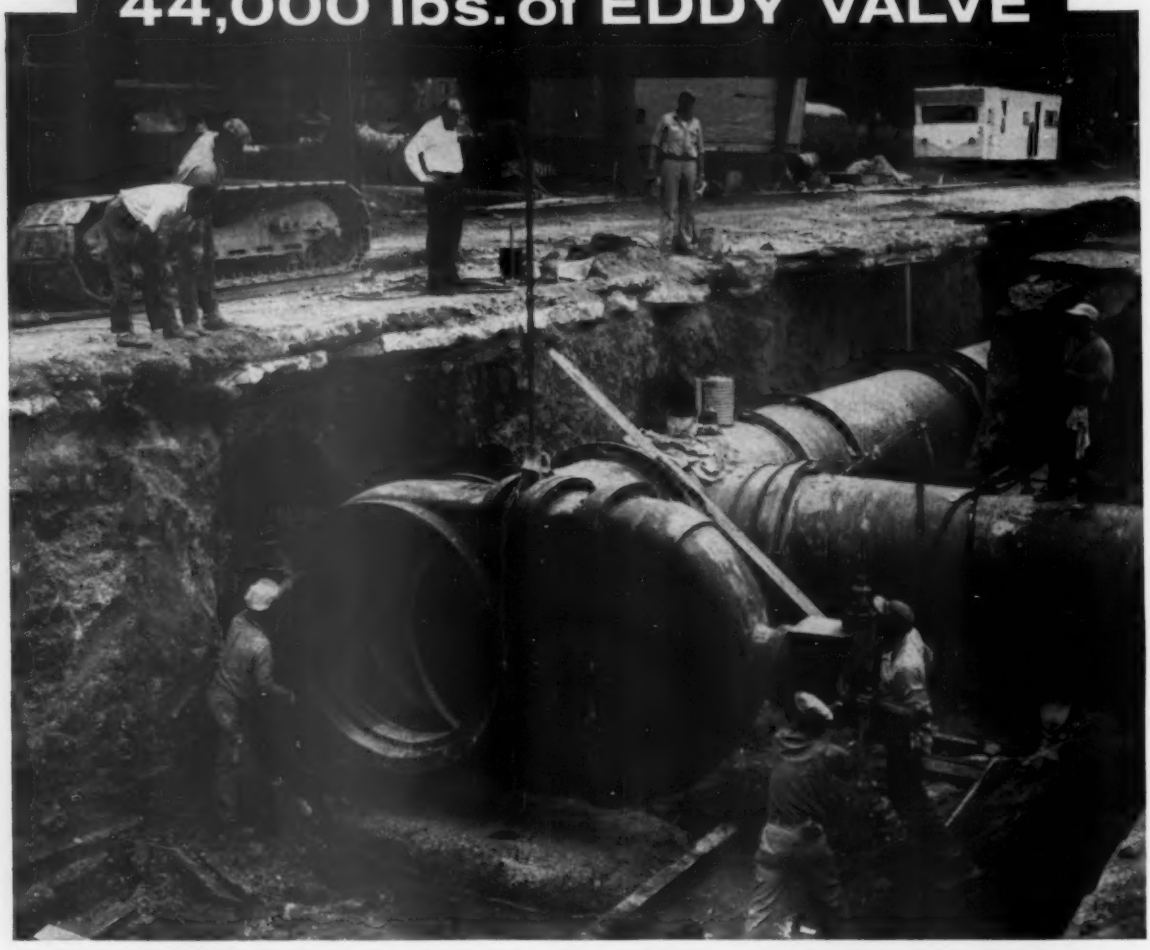
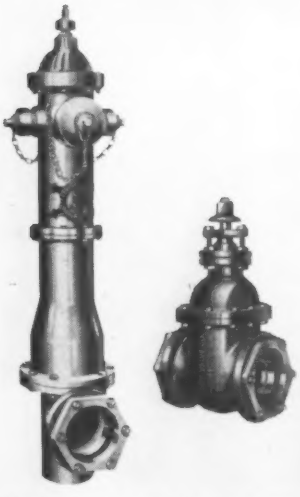


Giant 60″ Eddy Valves for Buffalo, New York



As part of a major waterworks improvement program, three 60″ and fourteen 48″ 300 lb. test IBBM EDDY valves have been installed by Fago Bros., Contractors, for Buffalo, New York. Each 60″ valve weighs 44,000 pounds; each 48″, 21,500 lbs. These are BIG valves...and do a BIG job.

EDDY's ability to supply valves of this size and ruggedness is the result of engineering skill and long experience in meeting almost every service requirement. EDDY manufactures a full line of valves for underground or special service to answer almost any specification for iron body valves.

Whether your requirements are for giant 60″ valves like these, or when you need valves for normal waterworks service, the same EDDY experience in serving the engineer and his community is at your service. Why not call EDDY when valves and hydrants first appear in your plans?

EDDY VALVE COMPANY
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WATERFORD NEW YORK

News—Here & There

Dr. Willem Rudolfs Dies In Netherlands

Dr. Willem Rudolfs, who for 26 years headed the Department of Water Supply and Sanitation at Rutgers University, died in Holland on Feb. 20. He was 73.

Upon his retirement from the State University in the fall of 1952, Dr. and Mrs. Rudolfs returned to their native Netherlands where they bought a home near Joppe, about 18 miles from Arnheim.

"Dr. Rudolfs was one of the great scientists of the New Jersey Agricultural Experiment Station," Dr. Martin, dean and director of Rutgers College of Agriculture and Experiment Station, said, "He and his Department won international fame during his tenure at Rutgers."

Students from all parts of the world studied under Dr. Rudolfs and he was called in as consultant many times by public health and water supply groups in this country and abroad. He was particularly interested in efforts to end pollution of the Raritan River.

He had to his credit an imposing list of more than 350 scientific papers, monographs and popular articles and belonged to a long list of scientific and professional societies.

He was educated at a government university in Holland, at the University of Illinois, the Pasteur Institute in Paris, and at Rutgers where he obtained his doctor of philosophy degree in 1921.

He is buried in the Gorssel Cemetery near Joppe.

Bird Retires from Pitometer Associates

Mr. Cyrus R. Bird has retired from active association with Pitometer Associates, and has been succeeded by Mr. W. D. Hudson.

Mr. Bird was graduated from Princeton University with the degree of C. E. in 1914, and served in World War I with the rank of Major. He joined the Pitometer Co., in 1919, and has been a member of the organization for nearly forty years as field engineer, District Manager and Vice President.

Mr. Hudson, who was graduated from Clarkson Tech. in 1933, joined the firm in 1941, and in 1957 was promoted to Principal Engineer after several years as assistant chief engineer. He has been in charge of the Atlanta office since 1950.

Corrosion Short Course Manual

The five-hundred persons who attended the 1958 Appalachian Underground Corrosion Short Course are receiving a copy of the Proceedings, which include 38-papers on underground corrosion and illustrations presented at the school.

The 1959 course, which is sponsored by the West Virginia University, will be held in Morgantown, West Virginia June 2, 3, and 4, 1959. The school covers the problems of underground corrosion, together with field demonstrations and exhibits by manufacturers and suppliers.

For additional information regarding the manual and the school contact Mr. J. H. Alm, Room 605, Two Gateway Center, Pittsburgh 22, Pa.

Missouri May Organize Water Conservancy Districts

A bill to authorize organization of water conservancy districts in river basin areas has been introduced in the state legislature.

The measure proposes a system of conservancy districts, organized in the manner of drainage districts, to handle various policies and plans for use and conservation of water resources. Main objective of such districts would be to prevent waste of water from pollution and other causes.

Under the bill, the districts would be empowered to employ chief engineers to prepare development plans subject to approval after hearings. Districts could levy up to 2 mills tax for financing their project and issue bonds on approval of two-thirds of the voters.

Fred Maurer Promoted to Managing Editor of Water & Sewage Works

The Scranton Publishing Co., Inc., is pleased to announce that Fred C. Maurer was promoted from Associate Editor to Managing Editor on February 1st. In this capacity Fred will be responsible for the managerial direction of both *Water & Sewage Works* and *Industrial Wastes.*

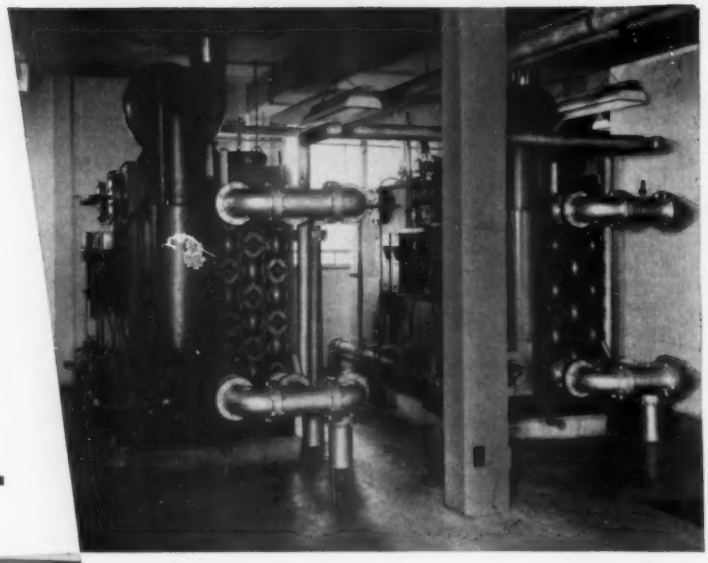
Prior to his present promotion, Fred Maurer has been Associate Editor of both publications since January 1958. Previous to that he was Assistant Editor of *Water & Sewage Works* since 1951, and Assistant Editor of *Industrial Wastes* since its inception in 1955.

Before joining Water & Sewage Works, in 1950, Mr. Maurer, was employed by the Public Relations Firm of John D. Whitmore, handling several of the principal accounts. One of these was the Woburn Chemical Corp. for whom he wrote technical articles for Chemical Engineering, American Paint Journal, India Rubber Works, and other journals covering application of the company's basic chemicals in these fields. He also prepared a complete series of Technical Bulletins on the company's products, and directed a Voice of America broadcast based on the company's chemical plant as being typical of the chemical industry in the United States.

Mr. Maurer spent four years in the United States Army Signal Corps., during which time, part of his tour of duty included duty as a communication instructor. He currently holds the rank of Captain in the Retired Reserve and he is a member of AWWA, NYSIWA, Society of Business Magazine Editors, and the Construction Writers Association.

Continued on page 9A

Evansville *Again* Selects P. F. T. Equipment.



ABOVE Efficient and economical digester heating is provided by these two P.F.T. #1000 Heaters and Heat Exchangers.

BELOW P.F.T. 75' Floating Covers are installed on all four digesters.

Progressive, growth-minded Evansville, Indiana, has selected P.F.T. equipment for its *second* sewage treatment plant—the West Side Plant.

The citizens of Evansville are proud of their plant's modern architectural design and the contribution it plays in the Ohio River Restoration Program.

Equally proud is P.F.T. and the part we have played in having equipment in both the East Side Plant and now the new West Side Plant.

P.F.T. equipment includes: Four 75' Floating Covers, two #1000 Digester Heaters and Heat Exchanger Units, four Liquidometer Cover Position Indicators, Supernatant Equipment and Gas Safety Equipment.

We'll be glad to send complete information on any of the equipment used in this installation.

Consoer, Townsend and Associates • Consulting Engineers, Chicago

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News—Here & There

CONTINUED FROM PAGE 7A

Ed. Alt Elected President WSWMA

Edward E. Alt, of Chicago Bridge & Iron Company, Chicago, was recently installed as president of the Water & Sewage Works Manufacturers Association.

Mr. Alt has represented Chicago Bridge & Iron Company on the WSWMA's Board of Governors for the past five years. CB&I has maintained active membership in the organization since 1909.

The new WSWMA president has long been a prominent figure in state and national associations in the water works field. At present, he is chairman of the steel tank affiliate of the Steel Plate Fabricators Association, a member of the Water Resources Committee of the Illinois State Chamber of Commerce, the Illinois Society of Professional Engineers and several American Water Works Association committees.

He is a past chairman and national director of the Illinois section of the AWWA and in 1956 was recipient of the organization's George Warren Fuller Award.

Water Policy

The United States Chamber of Commerce in its recent 1958-59 Policy Declarations on Natural Resources and Atomic Energy reflects the views and recommendations of every segment of business and area in the U. S. The following is an excerpt of the part pertaining to water resources policies, as stated by the Chamber:

"The Congress, through appropriate legislation, should establish a consistent and progressive water and land policy for the United States, which, among other things, should define the scope of the duties and obligations which the federal government legally can and should assume, and the limitations on its activities which it will honor."

"Interstate compacts, adopted by state legislatures and approved by Congress are recognized as serviceable instruments for bringing about action by a group of states in meeting common problems of a regional nature. When applied to the field of water resources, interstate compacts can be effective in accomplishing results that are not subject to fulfillment through more direct action by private initiative or local agencies. Likewise, interstate compacts can be used advantageously in providing for multi-state action on regional or basin-wide problems which otherwise might require unilateral action by the federal government."

"In any federal legislation on this subject, the principles of state control and local initiative and responsibility should be preserved. The states concerned, acting individually or through compacts, should enact appropriate laws and deal with pollution through agencies vested with authority and responsibility to establish, enforce, and administer suitable regulations."

Salt Water Conversion Field Accorded Bright Future

The second edition of "Science and Securities", a quarterly publication prepared and released by the research department of Harris, Upham & Co., a nationwide investment brokerage firm, states that "science and technology are making real progress in the struggle to realize one of man's ancient dreams: the economical conversion of salt water into sweet, potable water for human use. Success in this fight is a key to the effective solution of the economic problems that beset the Middle East and many other undeveloped areas—a scarcity of water imposes an economic ceiling."

Waterworks Management

At the last annual meeting of the Pennsylvania Water Works Association, the entire program consisted of a series of papers dealing with Waterworks Management. *Water & Sewage Works* has been fortunate in obtaining permission to publish all of these papers and will present them as a symposium on management in three parts. Part I will appear in the March issue.

Potomac River

The District of Columbia, Washington Suburban Sanitary Commission, has asked for bids on its biggest project in the 40-year history of the Commission.

Funds estimated at $4 million will be expended for a filter plant at Watts Branch on the Potomac River as the first part of a program to tap the river. By 1990, the project will have cost about $28.7 million.

Maryland

Another proposal to abolish the State Water Pollution Control Commission and merge its work into the program of the State Department of Health was again recently rejected by the State Legislative Council.

Portland Cement Elects New Members; Expands Field Service

The Portland Cement Association has elected four new members, and extended its field service activities into northern California and Oregon.

The four new members of the Association are: Halliburton Portland Cement Co., Corpus Christi, Texas; Saskatchewan Cement Co., Ltd., Regina, Saskatchewan, Canada; Northern California Division of Ideal Cement Co., San Francisco, Calif.; and Oregon Division of Ideal Cement Co., Portland, Ore.

Reestablishment of Association field service in northern California will be through a sub-office of its Los Angeles District Office, now established in San Francisco. Service to cement users in Oregon will be furnished through the Association's Seattle District Office.

Water Commission Recommended For Ohio

The Ohio Water Survey Committee, named by Governor C. William O'Neill has presented a possible solution to Ohio's water problem.

The committee urged that the current 103rd General Assembly consider the following:

1. Provide for acceleration and

Continued on page 11A

Layne

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INITIAL SURVEYS, EXPLORATIONS, RECOMMENDATIONS

SITE SELECTION

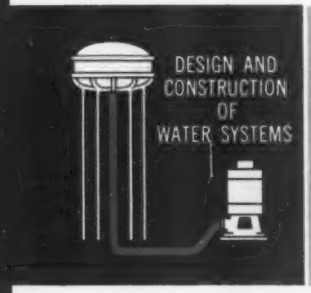
FOUNDATION AND SOIL SAMPLING

WELL DRILLING

WELL CASING AND SCREEN

PUMP DESIGN, MANUFACTURE AND INSTALLATION

Complete service means undivided responsibility


DESIGN AND CONSTRUCTION OF WATER SYSTEMS

COMPLETE RESEARCH STAFF AND FACILITIES

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CHEMICAL TREATMENT OF WATER WELLS

WATER TREATMENT

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LAYNE ASSOCIATE COMPANIES THROUGHOUT THE WORLD

News—Here & There CONTINUED FROM PAGE 9A

early completion of the basic water inventory studies now underway.

2. Adopt the statement of recommended water policy for the state.

3. Establish an overall authority, to be known as the Ohio Water Commission, with broad powers to encourage and co-ordinate water development on the part of private interests, local political subdivisions and agencies of the state . . .

In the recommendation for establishment of the Ohio Water Commission, the committee urged that this group should have power "(1) to hold hearings, subpoena witnesses and records and to make findings and recommendations, (2) to encourage and assist political subdivisions, watershed organizations and private interests in water developments, (3) to review co-ordinate and approve water development plans of state agencies, political subdivisions and private interests, (4) to referee conflicts among user interests and between geographic areas and (5) to recommend to the Governor and the General Assembly such policy and legislation with respect to water conservation and water management as would promote the economic and social development of the state."

Consulting Engineer Personnel

Roy F. Weston, Inc.

Vernon T. Stack, Jr., has been appointed director of the new Consulting Division of Roy F. Weston, Inc. He will be located in the Newton Square, Pa., offices. Mr. Stack was formerly group leader for development work in industrial waste disposal and hygiene for Union Carbide Chemicals Co.

Metcalf & Eddy

Mr. Andrew C. Paton has been admitted to partnership of Metcalf & Eddy. He received his Civil Engineering education at Tufts College after which he held positions with the Metropolitan District Commission and the Department of Public Works in Mass. In 1942 he came with Metcalf & Eddy as Senior Engineer on air base projects in North and South Carolina. As a lieutenant, he served in the 84th Naval Construction Battalion from 1943 to 1945. After the war he was Chief Engineer with Henley-Lundgren Co., on the construction of roads, bridges, and large sewers.

In 1951 he rejoined Metcalf & Eddy with whom he was Field Manager of the Thule and other Greenland Air Force installations then project manager for these installation, and later Director of Operations in the firm's Boston office.

Gannett Flemming Corddry & Carpenter

Houghton R. Hallock has joined the firm of Gannett Fleming Corddry & Carpenter, Inc., as Director of the General Engineering Division. He recently resigned from his position of Executive Vice-President of the Texas Atomic Energy Research Foundation. Previously he had retired as a Colonel from the Corps of Engineers, U.S. Army, after 20 years service. His army service included engineering and construction. assignments in Europe, Greenland, Hawaii and Okinawa, as well as 3 years as District Engineer in the Corps of Engineers in Forth Worth, Texas.

Ralph L. Woolpert Co.

Charles Abramovitz and John E. Eschliman have been admitted to partnership in the firm of Ralph L. Woolpert Co., Dayton, Ohio. Mr. Abramovitz graduated from Drexel Institute of Technology and has had his experience in design and supervision of subdivision developments. As alumnus of Antioch College, Mr. Eschiman has had his experience in water and sewer treatment plant design and supervision. Both teach the sanitary engineering courses at the University of Dayton.

Charles A. Maguire & Assoc.

Harold Bateson; Peter V. Cipolla; Robert L. Pare; Gordon Bronson; Thomas C. Murphy; Francis C. Pierce; and Eric Reeves have been admitted as Associates to the firm.

Wendell S. Brown and Edward O. Greene will act as special consultants to Charles A. Maguire & Associates.

Barge, Waggoner & Sumner

Mr. Wm. Hunter Owen, Assistant Director of the Division of Sanitary Engineering of the Tennessee Department of Public Health, has become an associate member of Barge, Waggoner & Sumner, Inc. Mr. Owen received his BS degree from Vanderbilt University in 1944, and MS in Sanitary Engineering from Harvard in 1950. He has been active in the AWWA and FSIWA, and is immediate past chairman of the Kentucky-Tennessee Industrial Wastes and Sewage Works Association.

Holladay & Westcott

Matthew G. Eggett, Chemical Engineer, has joined the firm of Holladay & Westcott, Los Angeles, Calif. Since 1950 he has been Assistant Executive Officer of the State of California Regional Water Pollution Control Board. Prior to this he was a research and development engineer with American Potash & Chemical Corp. His interests and efforts will be in the field of waste disposal and water treatment.

Nebolsine, Foth, McPhee

The firm of Nebolsine, Toth, McPhee Associates, have announced that W. W. Eckenfelder and D. J. O'Connor have become members of the firm. The head office of the firm is New York, N. Y.

Havens and Emerson

Glen H. Abplanalp; Alvin M. Mock; and Stanley H. Sutton have been admitted as Partners to the firm of Havens and Emerson, Consulting Engineers. George D. Simpson; Carl E. Lasher, Jr.; Philip H. Flewelling; and Sol Koplowitz have been advanced to Associates.

McFarland-Johnson

William H. McFarland, P. E. and John W. Johnson, P. E., have announced the formation of a new partnership McFarland-Johnson, Consulting Engineers. The principal offices are at 333 Front Street Binghamton, N. Y., and 405 Sidway Building Buffalo 3, N. Y.

A sure sign of spring for 50 years...

IOWA *hydrant on the job—neat, attractive, efficient. Easily serviced by one man.*

IOWA *valves and hydrants ready for installation—a familiar scene in hundreds of communities.*

IOWA VALVES AND FIRE HYDRANTS • 1909-1959

• This spring—as every spring for the last 50 years—more and more IOWA valves and hydrants are being put in place to serve the needs of hundreds of growing communities.

This spring, more than ever, waterworks officials and engineers will specify IOWA. Experience of 50 years shows them that IOWA valves and hydrants are built to specifications PLUS—have that extra quality of materials, that extra precise fitting and assembly that makes for longest life and easiest maintenance.

That's why IOWA products are a good buy—this year and every year. And IOWA's high standing in the waterworks field, backed by ample resources, assures parts and replacements will always be available for economical future maintenance. This long-time future service is part of what you buy at IOWA. That's why IOWA is a good company to do business with...this year...or any year.

Let us send you details on Iowa's complete line of valves and hydrants

IOWA

VALVE COMPANY

A Subsidiary of James B. Clow & Sons, Inc.

Oskaloosa, Iowa

Equipment News

Pneumatic Sewage Ejector

401

New England Pump and Machinery Co., Quincy, Mass., has developed a new low cost package type pneumatic ejector for handling small flows.

The new unit is rated to deliver 18 gpm of raw sewage or wastes and incorporates features of: packless float operation; expoxy lined steel receiver; minimum overall height; ½ hp motor; and controls are available for most electrical characteristics. Unit is shipped assembled for immediate installation.

Streamline Metering Pump

402

Hills-McCanna, Co., Chicago, Ill., has introduced its new Masterline Model metering pumps. Engineered to provide increased proportioning performance and economy, each model is encased with a streamlined, functional safety shield, thus offering a departure from the usual drab and commonplace appearance of pumps.

The pumps accurately deliver through a range from a fraction of a gallon to 1030 gph per feed. Powered by standard NEMA footmounted motors, the speed reducers are kept separate from the motors in order to simplify inventories and replacement. Improved drive mechanism features connecting rods that extend only 9° from the axis of the plunger. Thus the eccentric load is held to a minimum. The check valve assembly, designed to make the most of hydraulic principles, features a straight-through flow. In addition, inspection and maintenance has been greatly simplified.

A simple stroke adjustment also makes its initial appearance with the Masterline. Manual and automatic "in motion" stroke adjustment is available as optional equipment.

Cross-Country "Trenchliner"

403

Parsons Co., Newton, Ia., has announced the availability of the Parsons 420 "Trenchliner," designed especially for pipeliners who must handle cross-country and other big trenching jobs.

Giant digging wheel of the 420 has three speeds—115, 215 and 300 ft per minute. A multiplicity of digging speeds range from 15 in. to 25 ft per minute. Double-action hydraulic rams actuate the wheel for roading and grading.

Bucket widths possible with the model 420 are 36 in., 42 in., and 48 in. Optional sidecutters to increase trench widths to 40, 46, and 52 inches are available. Maximum depth of trench is 7 ft 6 in. Buckets for the 420 digging wheel are of formed steel, carry replaceable point type teeth and are available with either tine or solid backs.

A hydraulically driven, 36 in. wide

CONTINUED ON PAGE 15A

to reduce installation costs and corrosion problems
. . . provide maintenance-free service, specify—
WASHINGTON ALUMINUM EQUIPMENT
FOR WATER AND SEWAGE PLANTS

1-PC. ALUMINUM GUIDES AND STOP PLATES OR SLUICE GATES

Our one piece unit means faster, more economical installation. No more riveted flat bar assemblies or machined grooves. Non-corrosive.

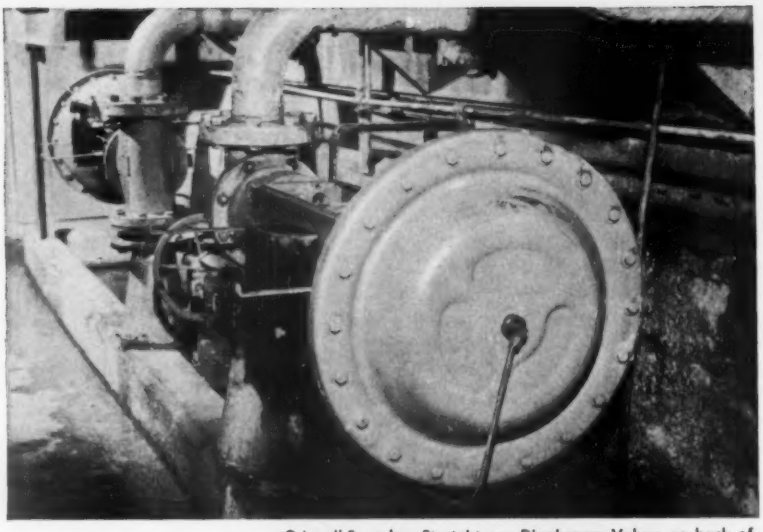
SAFE, NON-SKID ALUMINUM WALKWAYS

Special upset pattern provides non-skid safety. Never needs painting; resists rust and corrosion. I-Beam design gives "strength of steel" with far less weight.

For Free Product Literature, Write
WASHINGTON ALUMINUM CO., INC.
DEPT. 74, BALTIMORE 29, MARYLAND

WACO®

Found:
a valve responsive to sensitive instrument control, with low maintenance



Grinnell-Saunders Straightway Diaphragm Valves on back of Trimbey meter on Mead Corporation's No. 10 paper machine.

Grinnell-Saunders Straightway* Diaphragm Valves were originally selected by Mead Corporation for stock level control at its Chillicothe, Ohio paper making plant. Mead's instrumentation specialists wanted a valve which would provide fine control in response to sensitive instruments.

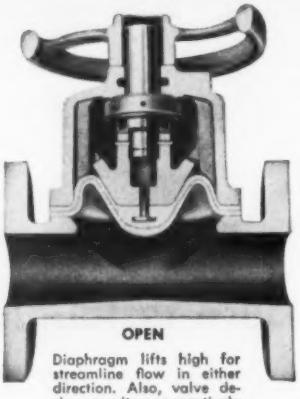
Because these Straightway Valves also avoid difficulties from clogging, stringing and dewatering as well as leakage, plugging, sticking and erosion, they have since been specified for other services throughout the plant.

Grinnell-Saunders Straightway Diaphragm Valves solve tough problems in many piping systems. They provide special benefits in lines handling corrosive fluids, viscous material, fibrous slurries, sludges, solids in suspension and semi-fluid materials.

These highly efficient valves provide streamlined flow, positive closure, complete isolation of operating mechanism, minimum maintenance, interchangeability of parts, manual or power operation, and a choice of body lining and diaphragm materials.

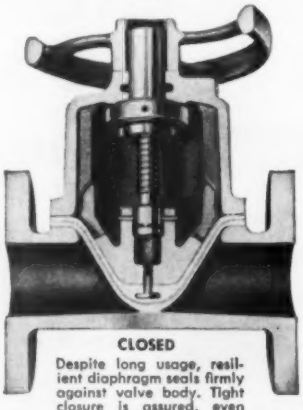
For complete information on straightway or standard weir types, handwheel, lever, or power operated, write Grinnell Company, Inc., 277 West Exchange Street, Providence 1, Rhode Island.

*PATENTED



OPEN

Diaphragm lifts high for streamline flow in either direction. Also, valve design permits comparatively simple rodding through, when necessary.



CLOSED

Despite long usage, resilient diaphragm seals firmly against valve body. Tight closure is assured, even when handling gritty or fibrous materials.

GRINNELL-SAUNDERS DIAPHRAGM VALVES

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

Equipment News

CONTINUED FROM PAGE 13A

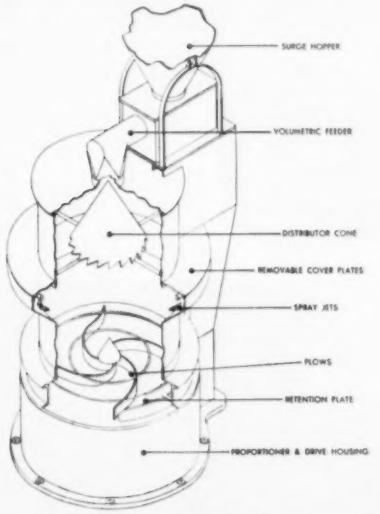
conveyor belt can be operated at 193, 378 and 621 ft per minute and is reversible.

Weighing approximately 42,000 lbs. the 240 has traveling speeds, ranging from 1 to 2.5 mph. Power is obtained from a 120 hp, 1500 rpm International Harvester diesel engine. A Caterpillar diesel engine is optional. Crawlers are 24 in. wide tractor grouser type with replaceable links, pins and bushings.

Continuous Blender For Dry Or Liquid-Dry Mixtures

404

The Johnson-March Corp., Philadelphia, Pa., has developed a new, continuous-flow blender that accurately proportions, mixes, blends and discharges a wide range of dry materials, or blends liquids with solids in precise quantities.



The blender, called "Verticone," has wide application both as a blender and as a dust preventative.

Materials to be treated or blended are fed proportionately into the Verticone via controlled volumetric feeding equipment onto the apex of a cone. This cone is the first step in blending of solids as it causes the material to form a circular, falling curtain as it leaves the base periphery of the cone.

As the base of the cone, spray head-

CONTINUED ON PAGE 17A

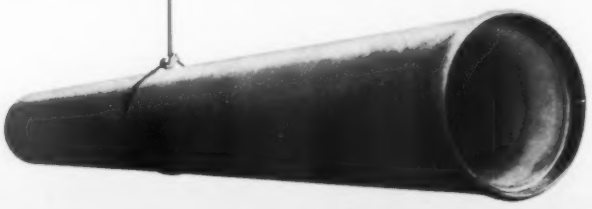
There's no time lost when backwashing GFC Multi-Cell Filters. While one cell is being backwashed, the other cells provide: **(a)** Water for backwashing that cell **with or without** the use of storage tanks or surface reservoirs. **(b)** Uninterrupted filtering to maintain a continuous flow to service lines. Other important features include low-cost installation and GFC's patented non-clogging "Multi-Plate" underdrains. Write for bulletins and equipment data.

GENERAL FILTER CO.
WATER PROCESS EQUIPMENT AMES, IOWA

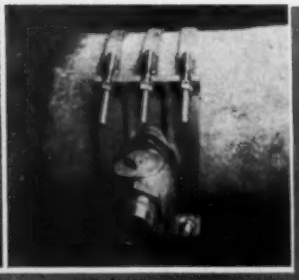
AERATORS • FILTERS • SOFTENERS • CLARIFIERS
FLASH MIXERS • FLOCCULATORS • PNEUMATIC CONTROLS
ROTARY DISTRIBUTORS • SLUDGE SCRAPERS

Tapping Water Lines Under Pressure

American Concrete Cylinder Pipe can be tapped with ease and economy while still under pressure.



The sudden explosive growth of many communities in the west has made it difficult for the best of advance planners to achieve both economy and adequate service in water supply systems designed for the future. The possibility of unpredictable requirements for service outlets was one of the factors taken into consideration in the design of American Concrete Cylinder Pipe. Without de-watering the pipeline, small or large diameter outlets can be easily installed by any water works service group using standard tapping equipment. New outlying areas which mushroom in the typical western growth pattern can be readily integrated into a planned system if American Concrete Cylinder Pipe is used for the transmission lines.



American PIPE AND CONSTRUCTION CO.

LOS ANGELES: 4635 Firestone Blvd., South Gate, Calif. LOrain 4-2511
HAYWARD: P.O. Box 630—JEfferson 7-2072
SAN DIEGO: P.O. Box 13—CYpress 6-6166
PORTLAND: 518 N.E. Columbia Blvd.—BUtler 5-2531
ALBUQUERQUE: P.O. Box 1782—CHapel 7-0486
PHOENIX: American Concrete Pipe Co. (Subsidiary) P.O. Box 12127—ALpine 2-7566

CONCRETE PIPE FOR MAIN WATER SUPPLY LINES, STORM AND SANITARY SEWERS, SUBAQUEOUS LINES

Equipment News

CONTINUED FROM PAGE 15A

ers can be provided to disperse any desired liquid into the mixture in any proportions required. Liquid is sprayed on the blended dry material from both inside and outside the curtain as it falls onto a retention plate. Further blending of both the solids and liquids is made on the retention plate by mixing blades that automatically discharge the completely blended and treated material.

In applications where only solids are blended, effective and economical dust control can be provided by conditioning with Compound MR solution. This is an extremely powerful surface active compound developed by Johnson-March, to keep the fine particles evenly dispersed to prevent segregation in the mix and eliminate dust. Controlled wetting in the Verticone is achieved with as little as a fraction of one per cent of moisture, or it may be precisely adjusted and metered to add any specific volume of moisture desired.

Unit Freezes Water Pipes

405

W. Leonard Hill, London, England, has developed a unit called the "Freeze-Seal Unit" designed for freezing water in a pipe to form an ice plug so that repairs to the pipe may be made rapidly and easily.

The unit consists of portable refrigeration set, with a refrigeration compressor driven through a V-rope, a freezing tool fitted with copper brushes suitable for the pipe size, and a drip tool.

Expansion is prevented by use of the drip tool, which allows an escape for the water that insures the formation of the ice plug with a hollow center of gradually diminishing size until the final moment of seal. As soon as the drip ceases to fall from the drip cock the repair may be made.

The unit is also useful for locating invisible leaks and eliminates the necessity of cutting the pipe for testing or opening long trenches for examinations.

CONTINUED ON PAGE 19A

Luxurious hotel protects the masonry of its reservoirs from leaking!

THORO System Materials employed for their sealing and waterproofing qualities

Workmen applying Thoroseal to heavy masonry structure required 30,360 *lbs. of Thoroseal*

Subterranean vaults house fuel oil and fresh water supply for Habana Hilton

Poured concrete rooms, two and three floors below basement level, were designed to house supplies of fresh water and fuel oil in the operation of the Habana Hilton in Cuba.

Although the masonry in these storage rooms was structurally sound, it was equally imperative that they be leakproof.

The **THORO** System materials were employed to seal the concrete structure of these unique rooms against leakage.

WATERPLUG, famous for its ability to stop leaks instantly, was applied to the joints where walls, floor and ceiling met and to anchor pipe and conduit fixtures.

THORITE, a twenty-minute set patching compound, was troweled into the honeycombing of the masonry.

THOROSET ingredient for hardening and waterproofing concrete was used in the mixture of a cement compound for trowel-coating over all surfaces.

THOROSEAL, applied in two heavy brush coats, sealed the masonry from all possible leakage.

THOROBOND, applied to the extra smooth sections of the poured masonry, made it possible to bond both **THOROSET** and **THOROSEAL** to the surface.

P & W Floor Hardener gave floors extremely hard wearing surface.

Write for our NEW 20 page brochure

Standard Dry Wall Products Inc.

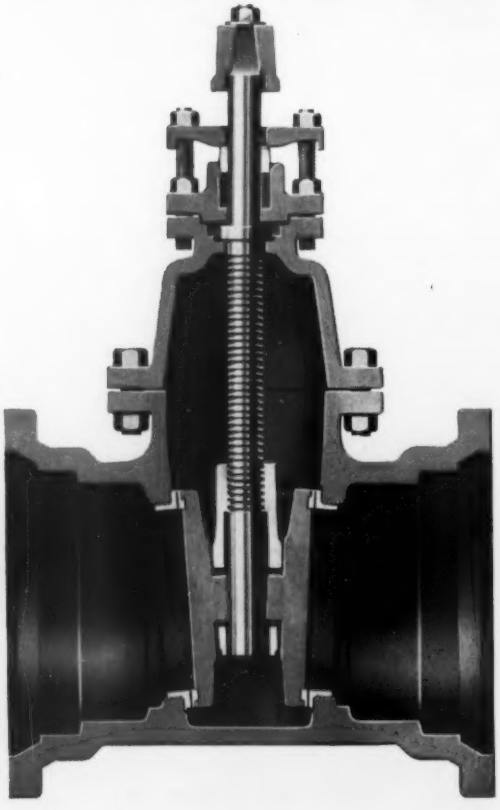
NEW EAGLE, PA. **CENTERVILLE, IND.**

R.D. WOOD GATE VALVE

THE R. D. WOOD GATE VALVE...
DESIGNED TO BE
BURIED AND FORGOTTEN

- So simple and sturdy that it lasts for generations
- Always ready to operate when needed
- Only 3 moving parts—the spreader and two discs

Available with conventional or "O" ring packings



R. D. WOOD COMPANY

Public Ledger Building, Independence Square
Philadelphia 5, Pa.

Manufacturers of Mathews Hydrants and "Sand-Spun" Pipe
(centrifugally cast in sand molds)

Equipment News

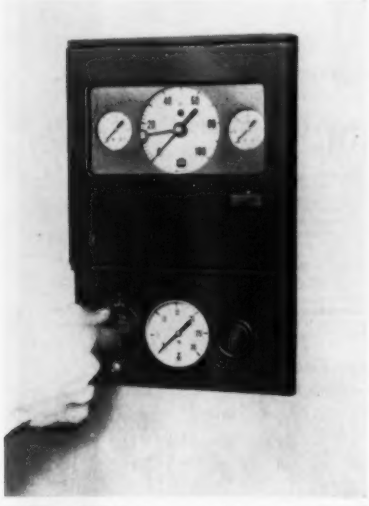
CONTINUED FROM PAGE 17A

New Control By-Passes Automatic Process Controller

406

Machine and Metals, Inc., Sellersville, Pa., has developed a new four position Control By-Pass.

The new unit is offered as an option with USG "Pilot" controller which can be used for control of temperature, pressure, liquid level and other process variables. Its prime function is to give the plant operator a ready means for cutting off controller air to the valve (or damper, etc.) and for positioning the valve manually.



The USG four-position Control By-Pass also permits "bumpless" transfer from manual to automatic control. This means that when the transfer is made, the operator can match output air pressures from controller and manual regulator so that no difference exists to upset the process.

The new USG Control By-Pass mounts directly below the indicating controller, forming an integral unit which measures only 8½ in wide by 11½ in high. For locally mounted installations, this combination offers a very economical and compact means of obtaining automatic control with a four-position by-pass. The assembly can be yoke-mounted on a diaphgram motor valve, where it provides the dual function of controller

CONTINUED ON PAGE 21A

Where water is used, process equipment and storage tanks are sure to corrode unless protected by an E.R.P. cathodic protection system. Even with these concrete high rate clarifiers at the St. Regis Paper Company plant near Jacksonville, Florida, it pays to protect the metal parts with an E.R.P. cathodic system.

Engineering PLUS...

E.R.P. cathodic protection pays off in maintenance savings

In industry or public service, water treatment is a big investment. To protect that investment in water treatment equipment could be a tremendous maintenance job. Even with concrete clarifiers, it pays to use E.R.P. cathodic protection. When there are metal tanks involved, just one cleaning and painting can cost more than a complete E.R.P. cathodic protection system.

From preliminary design to continuing periodic corrosion surveys, experienced corrosion engineers measure, analyze and design specifically for your corrosion problems. That is the only way corrosion can be virtually eliminated.

E.R.P. engineering plus prevents corrosion of water storage tanks, water and sewage treatment structures and pipelines. For full information on how E.R.P. can help you save maintenance costs, write for bulletin E-46.94.

ERP CATHODIC PROTECTION SINCE 1935

ELECTRO RUST-PROOFING CORP.

A SUBSIDIARY OF WALLACE & TIERNAN INC.

30 MAIN STREET, BELLEVILLE 9, NEW JERSEY

CABLE: ELECTRO, NEWARK, N. J.

W&T DRY CHEMICAL FEEDERS

For Accurate Feeding Of Water Treatment Chemicals

Full line of wide range dry chemical feeders capable of controlling a few ounces to 3000 lbs. per minute.

Write for Bulletin M-38 for complete Dry Feeder information.

WALLACE & TIERNAN INCORPORATED

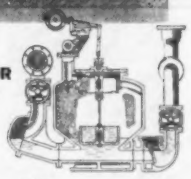
25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

It's HERE!

25-Year Protection on Pneumatic Ejectors

Only Yeomans dares to back specifications with this long-term warranty...

SHONE®
PNEUMATIC EJECTOR
Mechanically-Controlled



Twenty-Five Year Warranty

Subject to the limitations herein contained, YEOMANS BROTHERS COMPANY warrants its mechanically-controlled Shone Pneumatic Ejector against defects in workmanship and materials under normal use and service for twenty-five (25) years after installation as specified in factory recommendations. The Company's responsibility under this twenty-five year warranty is limited to replacing or repairing without charge, f.o.b., its works, any of the following components: sewage (or waste) receiver, mechanical air and exhaust control and the Shone inlet and discharge check valve. All other parts are subject to the manufacturer's warranty of one year.

Written notice must be given to the Company immediately upon discovery of any defect. The Company shall have the option of requiring the return of a defective component or material, transportation prepaid, before accepting a claim. In no event shall YEOMANS BROTHERS COMPANY be responsible or held liable for delay or damages of any kind or character resulting from or caused directly or indirectly by any defective component or material. This warranty shall not apply to any component or material repaired or altered outside of the Company's works unless the Company's written approval in that respect is first obtained and no allowance will be made for such repairs or alterations without the written consent or approval of the Company.

This Warranty is in lieu of all other warranties, expressed or implied, and is in lieu of all other obligations or liabilities on the part of the Company. No other person is authorized to vary the terms or provisions hereof in any respect.

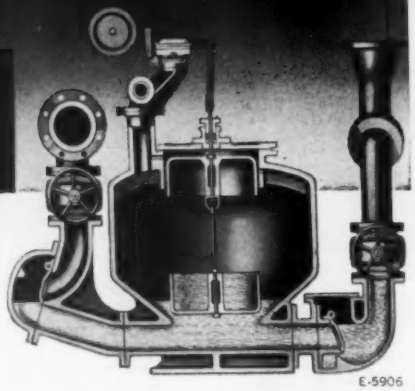
YEOMANS BROTHERS COMPANY
D. W. Burgoon
PRESIDENT

SERIAL No. OF UNIT

YEOMANS

1999-9 North Ruby Street, Melrose Park, Illinois

This is the SHONE® with mechanical controls. It is the original pneumatic ejector. The first SHONE® was installed in 1870.



E-5906

WORLD'S LARGEST AND BEST LINE OF PNEUMATIC EJECTORS

Equipment News

CONTINUED FROM PAGE 19A

and manual operator for the valve.

The U. S. Gauge Control- By-Pass has three main components (1) a four-position air transfer switch with "Text", "Manual", "Auto" and "Service" positions; (2) a 2½-inch dial gauge for indicating the manually regulated air pressure; and (3) a manual loading air pressure regulator with adjusting knob on front of panel. In addition, the unit features a push-button valve, which permits comparison and matching of controller output and manual loading pressures.

Spray Nozzles Pass Large Quantities At Low Pressures

407

Schutte and Koerting Co., Bucks County, Pa., has introduced a new line of Spray Nozzles for general service in discharging large quantities of liquids at low pressures. These nozzles produce medium to coarse, evenly distributed, solid-cone sprays with a normal spray angle of 70°.

Hexagonal on the exterior, these nozzles are stocked in bronze and stainless steel and can be made of Everdur, Monel, or other corrosion-resistant materials on special order.

The nozzles are identified as Fig. 627 Spray Nozzles, and are available in ten orifice sizes to provide a wide range of capacities. With water supplied at 10 psig, the smallest nozzle will discharge 1.2 gpm and the largest 120 gpm. With pressure increased to 100 psig the discharge rates are 3.75 and 375 gpm, respectively. At the other extreme of the pressure scale the nozzles will produce solid-cone sprays with uniform distribution at pressures as low as 3 psig.

Manometric-Electronic Pressure Switch

408

Meriam Instrument Co., Cleveland, Ohio, has developed a new precision pressure switch capable of extremely accurate and sensitive response. Consisting of a contractor manometer and

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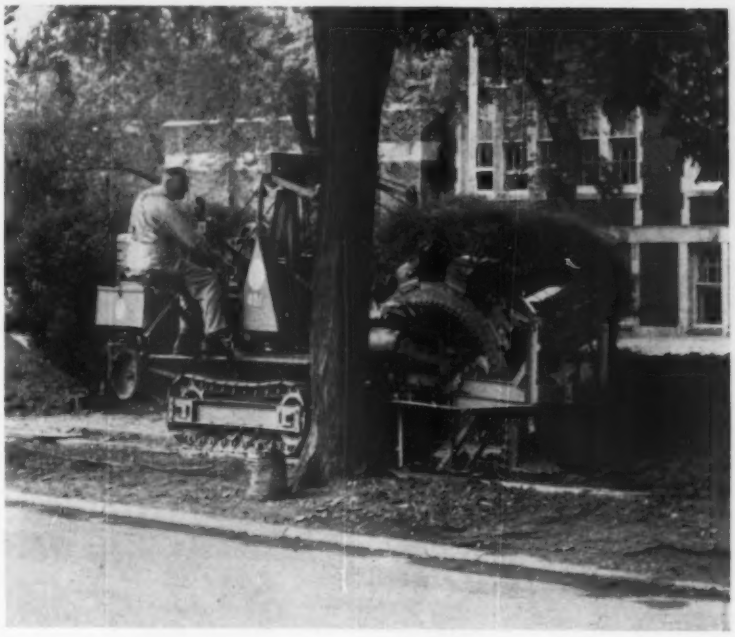
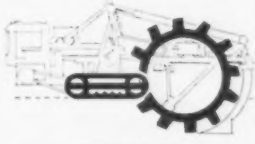


Nothing digs trench in the city like a Cleveland "Baby Digger"

PUTS TRENCH WITHIN 20 INCHES OF A PARALLEL WALL

MORE THAN 30 USABLE COMBINATIONS OF CRAWLER AND DIGGING WHEEL SPEEDS



GIVES YOU THE RIGHT COMBINATION of POWER and SPEED FOR EVERY SOIL AND JOB CONDITION

If your jobs involve city and suburban trenching, a trim maneuverable Cleveland 92 is the trencher for you. This "Baby Digger" has the practical features and advantages that give you greater, more economical production in crowded areas *...more trench...in more places...at less cost.*

- Only 4' 6" wide over its crawlers.
- Shiftable, reversible conveyor.
- Digs easily past trees, poles, fences, etc.
- Digs 10" to 20" wide...down to full 5' deep.
- Full crawler mounting...completely maneuverable...perfect balance and stability...easy on lawns, sidewalks, etc.
- Finest crawler on any trencher...long-lived...non-packing...easy-rolling...friction-free...sealed bearings...200-hour lubrication.
- Easily portable...hustles from job to job at safe, legal-limit truck speeds.
- Used on thousands of miles of trenching for gas...water...sewer...telephone...electric power...building footings...airport, highway construction.

fast • accurate • clean • dependable nothing digs trench like a Cleveland

The CLEVELAND TRENCHER Co.

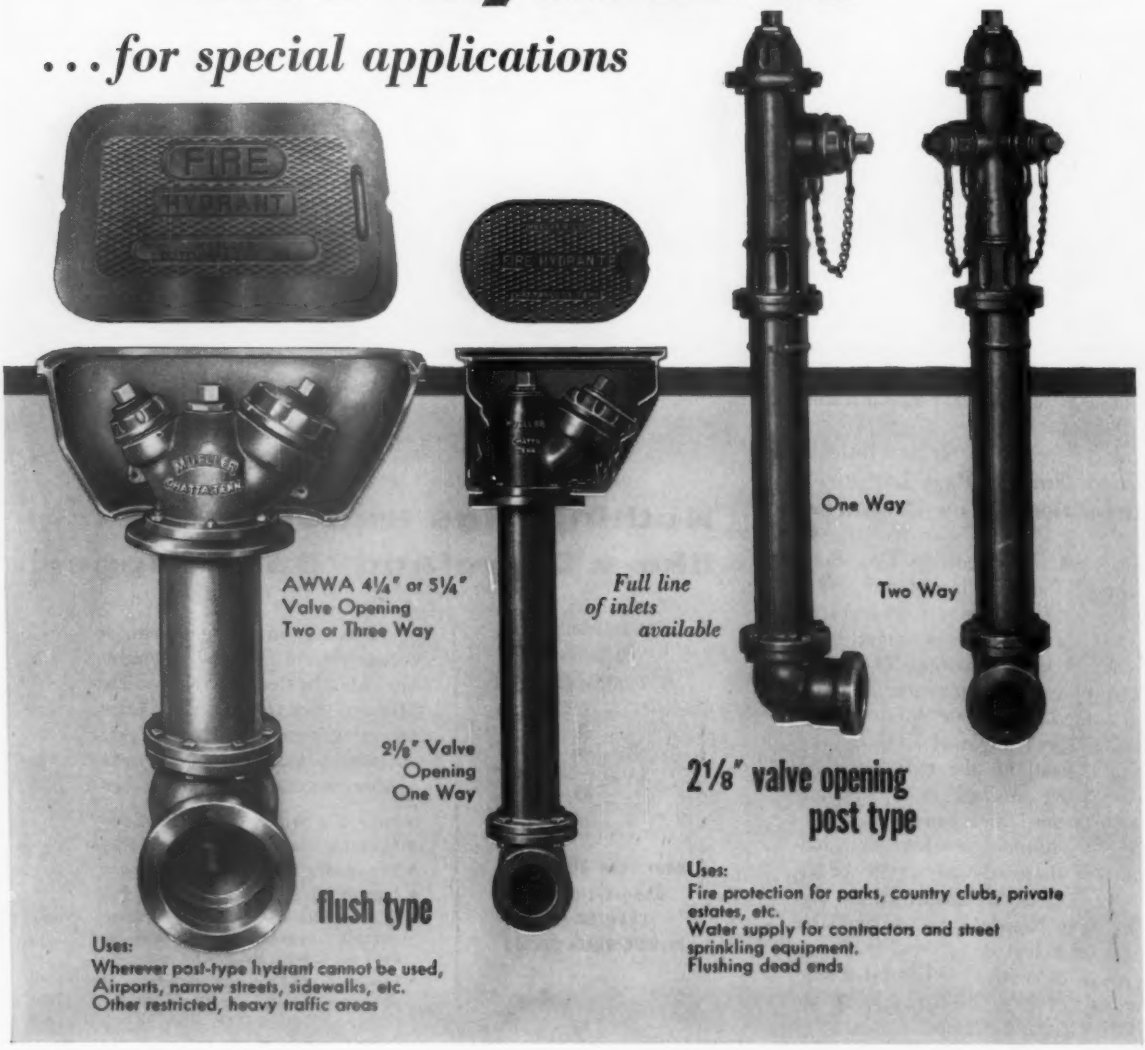
20100 ST. CLAIR AVE. • CLEVELAND 17, OHIO

Good Everywhere ®

MUELLER®

fire hydrants

...*for special applications*



These fire hydrants for special applications are just a part of the full line of fire hydrants produced for municipal, industrial and private fire protection systems by Mueller Co.

The design and quality of these special hydrants is exactly the same as Mueller AWWA Standard Fire Hydrants for municipal use. Compression type main valves, automatic drain valve mechanisms and "O" ring stem seals are just a few of the features. The only difference in the 2⅛" valve opening hydrants is size.

The use of these quality features in *all* Mueller fire hydrants is typical of the great attention to detail in research, design and engineering that becomes a part of every Mueller product made for the water industry.

Write for complete information.

MUELLER CO. **DECATUR, ILL.**

Factories at: Decatur, Chattanooga, Los Angeles;
In Canada: Mueller, Limited, Sarnia, Ontario

Equipment News

CONTINUED FROM PAGE 21A

a reply-power-supply package (tradenamed Manotac), the unit may be used for alarm signalling and/or control in applications involving pressure, vacuum, differential pressure, flow and liquid level.

The use of a special indicating fluid gives a make-or-break control sensitivity of 0.005 in. of water; the instrument can sense pressure increments as small as 0.003 oz per sq in. with complete dependability.

Switching functions are handled by the Manotac Relay-Power Unit, which operates at 110V AC. It features modular construction that makes use of interchangeable plug-in circuit cards. Each carries all components governing one contact point on the manometer and may be removed or inserted without affecting operation of other points. Individual load relays are fully enclosed and have D.P.D.T. switching action. Manotac units are made in two types: plug-in for quick, temporary connections, and tamperproof for permanent monitoring or control application. Both are available in five points. Contact capacity is 5 amperes per point at 115 volts, AC.

Oil-Filled Submersible Motor For Four-Inch Wells

409

General Electric, General Purpose Motor Dept., Schenectady, N.Y., has announced the first oil-filled submersible motor ever offered as a complete unit for four-inch well applications.

Because of its design, the new submersible motor can carry significantly greater loads per rated horsepower than other type construction, according to company engineers.

Fast heat dissipation is one of the primary advantages of the oil-filled design, the engineers said. The motor's large supply of highly refined mineral oil continuously circulates around the windings with rotor movement quickly transferring internally generated heat to the cool motor shell. This efficient heat transfer is the principal reason or the motor's high load carrying ability, according to the engineers. A ½-hp unit, for example, offers a 1.60 service factor.

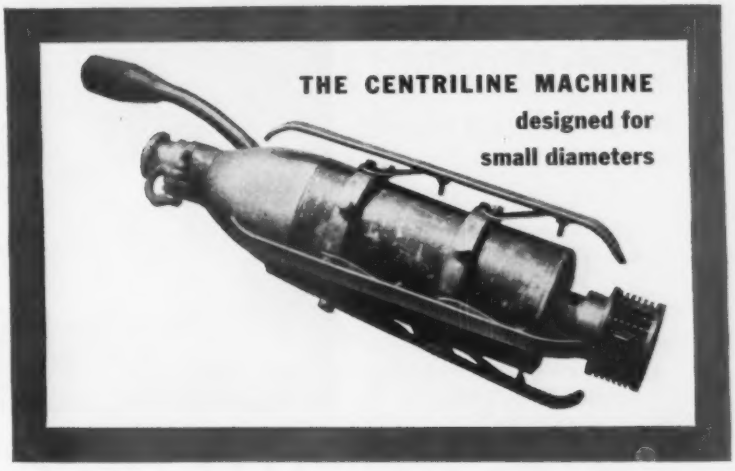
The oil-filled design provides inherent protection against stall and other overload conditions. The windings have unrestricted freedom to expand which helps prevent damage during heat generating conditions.

A specially designed lead seal eliminates capillary action of the lubricating oil. The lead connection—solid in the middle and molded in neoprene—avoids oil loss and lead deterioration. A sand slinger throws foreign particles away from both shaft and seal by centrifugal force. The slinger helps extend motor life by preventing abrasives from entering the motor. The shaft seal is of a specially designed carbon-ceramic construction.

Stator windings on the new submersible pump motors are protected against electrical stresses and moisture with Mylar polyester film, selected Formex.

CONTINUED ON PAGE 25A

NOW! THE CENTRILINE PROCESS is available for 6" to 14" mains, too!



Yes, your city's small but important transmission and distribution lines can also regain their original flow capacity and pressure through the universally accepted Centriline Process of centrifugally applying a cement-mortar coating to the pipe walls. If some of your lines inadequately serve your customers' requirements, including higher demands for fire protection, investigate the numerous advantages of Centrilining your mains now.

The new, small diameter Centriline Machine eliminates most excavations at valves, laterals and corporation cocks. By eliminating these fixed costs, lengthening the distances between access openings and permitting faster lining speeds, the new Centriline Machine has really reduced the cost of lining small mains. So much so, in fact, that every water works operator should reevaluate the economics of small pipe rehabilitation.

Send today for your copy of our illustrated booklet which fully describes how Centriline can help you salvage worn out pipes from 6" to 144" in diameter permanently and for much less than you would imagine.

CENTRILINE CORPORATION

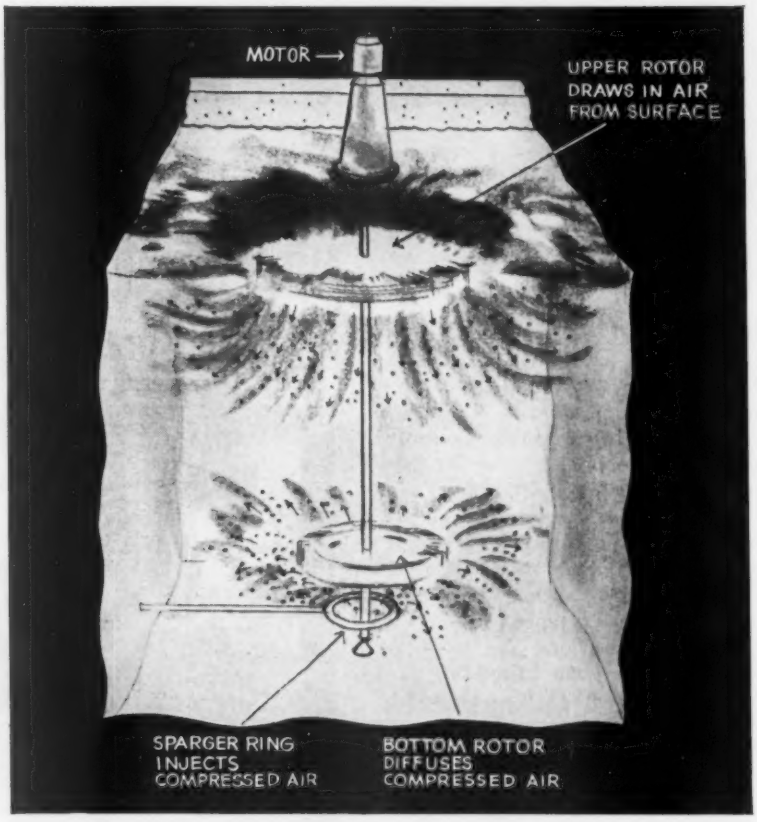
A Subsidiary of Raymond Concrete Pile Company

140 Cedar Street
New York 6, N. Y.
WOrth 2-1429

Branch Offices in Principal Cities of the United States, Canada and Latin America.

FLUIDICS

is a Pfaudler Permutit
program providing
the know-how
the equipment
and the experience
for solving problems
involving fluids



FLUIDICS AT WORK

New PERMUTIT AERATOR

Increases O_2 transfer over 65% without adding power . . . with Permutit's new process Bio-Oxidation Aerator.

Developed in laboratory and pilot plant operation, now confirmed and proven in a large industrial waste treatment installation, Permutit's new Aerator sets a new high in rate of oxygen transfer per horsepower.

Permutit's design of the double turbine introduces oxygen from the surface as well as from a sparger ring. Oxygen transfer per horsepower has increased from conventional rate of .86 lb. per hour to 1.5 lbs. per hour.

The Permutit Aerator can be installed in existing basins as well as in new systems. To help you achieve such efficiency in your Bio-Oxidation system, we will be glad to review your operating data and make recommendations.

Other Pfaudler Permutit equipment for waste treatment includes: Colloidair Separators, Precipitators, Titan Centrifuges, Ion Exchangers, Filters, Chemical Feeders, Evaporators, and Degasifiers. Call or write our Permutit Division, Dept. WS-49. 50 West 44th Street, New York 36, New York.

FLUIDICS covers such varied phases of fluid handling and control as:

waste treatment	distillation
water treatment	drying
corrosioneering	blending
reactions	metering
polymerization	valving
ion exchange	flow rate control
fluid analysis, metering and control	piping
	storing
	centrifuging
agitation	filling
evaporation	heat transfer, etc.

Whenever you have a fluid-handling problem, look to the Pfaudler Permutit FLUIDICS program for the best solution.

PFAUDLER PERMUTIT INC.

Specialists in FLUIDICS . . . the science of fluid treating and processing.

Equipment News

CONTINUED FROM PAGE 23A

Manometers Have Integral Bypass 410

King Engineering Corp., Ann Arbor, Mich., has developed U-type manometers with an integral 3-valve bypass manifold to facilitate operation in flow measurement and other differential pressure applications. This gives a more compact, convenient and economical installation than previous arrangements using separate valves and piping.

The manometer head has a built-in shutoff valve for each of the two pressure lines, and a bypass valve in a connecting passage between. When the bypass valve is opened, the pressure on the two legs of the manometer is equalized. This permits (1) operating the shutoff valves with no risk of blowing the liquid out of the manometer and (2) checking the zero setting.

With the shutoff valves closed, removing a hex-head screw in the top of the head permits detaching the manometer case-and-tube assembly for cleaning without disturbing the piping connections or closing remote valves.

These manometers are available in two models: (1) Single-cleanout, with a formed glass U-tube, and (2) double-cleanout, with two straight glass tubes connected by a passage in a removable cleanout head at the bottom. There are 8 sizes of single-cleanout manometers, from 6″ to 50″ range, and 16 double-cleanout manometers from 6″ to 130″ range. All have a maximum working pressure of 250 psig; and all are available with wetted metal parts of carbon steel, brass, or stainless steel.

Large Diameter Plastic Pipe 411

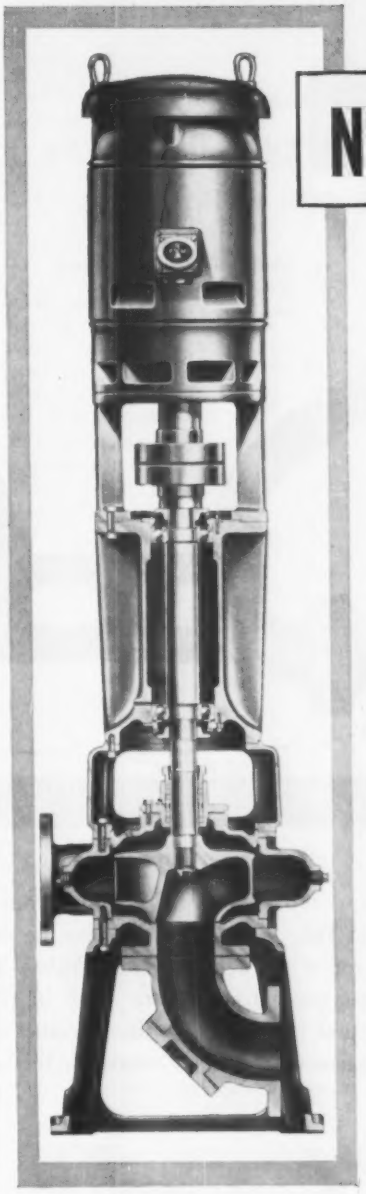
Carlon Products Corp., Aurora, Ohio, has announced that a new development by Allied Chemical now makes it possible for the first time to manufacture polyethylene pipe in large diameter sizes from A-C Polyethylene Pipe Compound.

The development of a new extrusion technique and die design to han-

CONTINUED ON PAGE 27A

For higher pumping efficiency

of solids in suspension!



NEW

Fairbanks-Morse

5440A Non-Clog Pumps

Ideal for pumping unscreened liquids with large solids in suspension

- industrial wastes
- sanitary sewage disposal
- industrial processes

Here is your answer to higher efficiencies wherever you are pumping solids in suspension!

All-new Fairbanks-Morse 5440A Non-Clog Pumps feature quick, easy convertibility between any of the many vertical and horizontal types. Power requirements of the pump are always perfectly matched to the electrical and mechanical components. Precision-machined centering fits assure accurate alignment. Exclusive F-M bladeless impeller design minimizes maintenance by preventing clogging from solids and stringy material. The 5440A is only one of many F-M solids-handling pumps designed to meet a broad range of requirements. For information, write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

Ask for new 5440A BULLETIN!

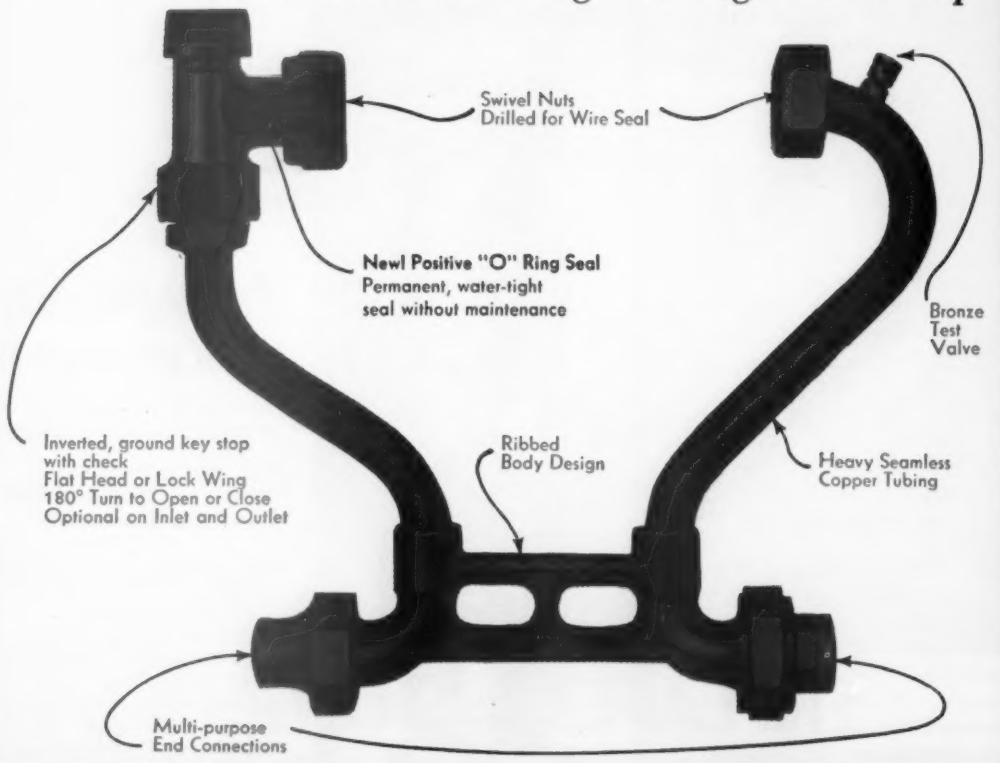
FAIRBANKS-MORSE

a name worth remembering when you want the BEST

ELECTRIC MOTORS • DIESEL, DUAL FUEL AND GAS ENGINES • PUMPS
COMPRESSORS • GENERATORS • MAGNETOS • HOME WATER SYSTEMS

now! MUELLER®
copper meter yokes

...with a new "O" ring seal angle meter stop!



This exclusive new angle meter stop — now used on all Mueller Copper Meter Yokes — has a positive "O" ring seal at the top of the key. This "O" ring, plus the generous ground key surface between the port and top of the body, gives a dependable *double* seal against leakage.

Before your next water meter installation, consider the many features of Mueller Copper Meter Yokes. They are typical of the attention to detail in research, design and engineering that becomes a part of every Mueller product made for the water industry.

Write direct for details on the full line of Mueller meter setting equipment.

MUELLER CO. **DECATUR, ILL.**

Factories at: Decatur, Chattanooga, Los Angeles;
In Canada: Mueller, Limited, Sarnia, Ontario

Equipment News

CONTINUED FROM PAGE 25A

dle Allied's ultra-high molecular weight polyethylene resin enables the company to enter a field heretofore held by metal, ceramic and fiber pipes.

Because of its unusually high melt viscosity — A-C Polyethylene Pipe Compound cannot be extruded by ordinary methods. A successful extrusion technique utilizing standard extrusion machinery has been developed by Allied to take full advantage of the excellent physical properties of the compound.

According to Allied the weight and arrangement of the molecules in the new pipe compound are directly responsible for the long life and durability of the pipe.

Test data from Allied Chemical's Central Research Laboratory at Morristown, N. J. show the new pipe compound has a useful life expectancy of 50 years at pressure ratings several times higher than conventional polyethylene. This information indicates the stress-life performance of the pipe. In addition, investigation shows no cracking, slitting or pin holing in the pipe.

In a typical test the pipe was cycled 90,000 times to three times normal pressure for one second out of every ten with no deterioration.

The high strength of A-C Pipe Compound makes possible the extrusion of large diameter pipe without unusual increases in wall thickness.

Large diameter polyethylene pipe can be made in any length desired and is easily and securely joined by flanging of the ends.

A-C Polyethylene Pipe Compound has been approved for use in potable water installations by the National Sanitation Foundation.

White Core Plastic Pipe

412

Quaker Rubber Div., H. K. Porter Co., Inc., Philadelphia, Pa., has announced that after several years of intensive research and development, it has lowered the cost of polyethylene pipe without sacrificing wall thickness, pipe weight or burst strength.

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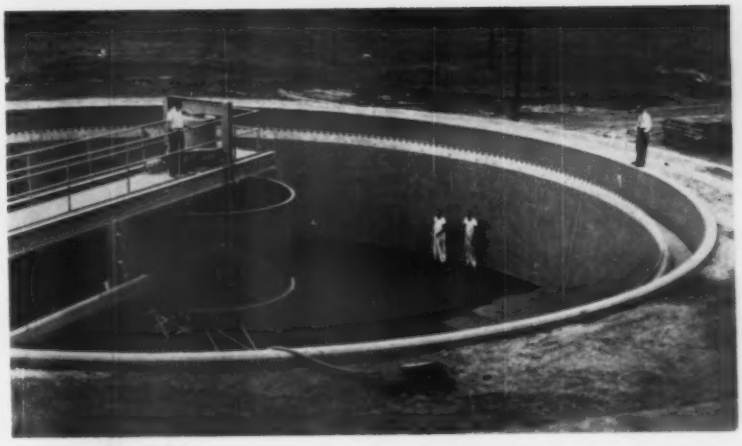
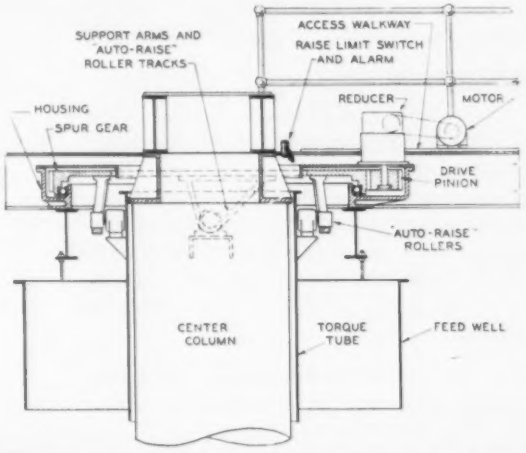


PAPER MILL INSTALLS SECOND HARDINGE CLARIFIER FOR WASTE TREATMENT

The P. H. Glatfelter Company, paper manufacturers at Spring Grove, Pa., have gone a step farther in keeping wastes from its manufacturing processes out of the nearby Codorus creek. Recently, a $100,000 addition to its waste treatment plant was put into operation. It is a twin to a Hardinge Clarifier that has been in use for a number of years. Besides doubling the mill's waste treatment capacity, it will help remove more solids from the main effluent flow.

Each clarifier is 75 feet in diameter and 15 feet deep. They hold nearly a million gallons and will provide two hours' settling time for the main effluent on its way to the Codorus. The main waste from the mill is pumped to the clarifier as shown here. The clarifier removes fiber and clay residues from paper processing waters. The average amount taken out of the waste amounts to from 10 to 15 tons a day.



Typical Hardinge Clarifier Drive Mechanism for large, center column supported units. "Auto-Raise" feature lifts the scrapers in case of an overload, preventing breakage. Bulletin 35-D-15

HARDINGE
COMPANY, INCORPORATED
YORK, PENNSYLVANIA • 240 ARCH ST. • Main Office and Works
New York • Toronto • Chicago • Hibbing • Houston • Salt Lake City • San Francisco • Birmingham • Jacksonville Beach

TYLOX® RUBBER PIPE GASKETS

Keep sewage waste IN . . . ground water OUT of new interceptor sewers

In places the lines ran adjacent to, and below the level of the Yellowstone River, but designers of the project were not afraid of infiltration . . . They knew they could rely on the rubber-tight, *compression* seal of Tylox Gaskets to prevent leakage in or out of the pipe, to keep roots and sediment out, and to *flex* instead of rupturing if pipe should "angle" under the stress of unstable soils.

But that's not all . . . in specifying Tylox, engineers took advantage of the gasket's ability to cut job costs by speeding pipe-laying. They knew, too, that once under ground and under compression, acid-resistant Tylox would outlast the pipe itself.

✻ **PROJECT:** City of Billings, Montana: Interceptor sewers.

ENGINEERS: Sam Ward, City Engineer, and Kel Bainum, Assistant City Engineer, Billings, Montana

CONTRACTORS: C. B. Lauch, General Contractor, and Lloyd B. Lockrem, Construction Contractor, Billings, Montana

PIPE: 24" to 36" Reinforced Concrete Pipe with Tylox Rubber Gaskets, furnished by Elk River Concrete Products Co. of Montana, Billings, Montana

WRITE FOR MORE TYLOX DATA. Brochure contains engineering information, suggested specifications, and installation instructions. Illustrated case histories show Tylox projects in cities all over the world. Get it for your data files.

® Tylox is reg. T.M. of Hamilton Kent Mfg. Co.

HAMILTON KENT MANUFACTURING COMPANY
KENT, OHIO
427 West Grant Street Orchard 3-9555

CANADIAN PLANT: 10 Brussels St., New Toronto, Ont., Phone: CLifford 1-2494

5116

Equipment News

CONTINUED FROM PAGE 27A

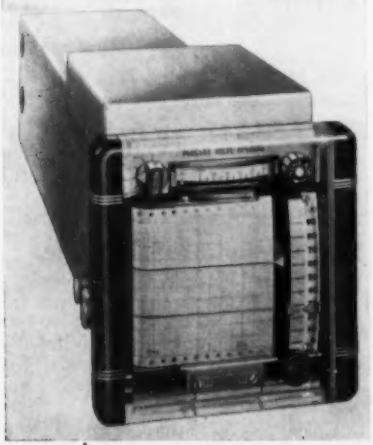
By adding a pure white polyethylene core, the pipe also takes on excellent eye appeal and assures hospital clean, antiseptic white conditions for conveying water or other liquids for human consumption. Quaker's new white core pipe guarantees non-toxic conditions by using a 100% virgin core material without the addition of carbon black.

Quaker also manufactures two other types of polyethylene plastic pipe; Porter 200, for applications where larger pipe diameters are required; and Porter 201 for industrial use, such as irrigation, mine drainage and other applications.

Two Pen Recorder Has Optional Control

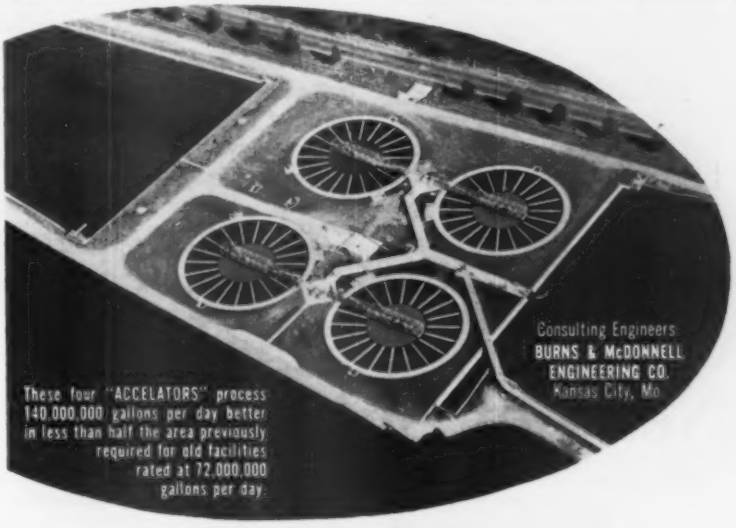
413

Swartwout Co., Cleveland, Ohio, has developed a new, all-electronic two-pen recorder which records two variables on a single chart. The recorder permits the user to make quick, "one-glance" checks of a pair of related variables, or to cut instrument costs and conserve panel space. As an optional feature, the two-pen recorder can be furnished with a control set point, or alarm contacts, or both, for one of the variables.



Like Swartwout single-pen recorders, the two-pen recorder fits a 5-inch square panel cutout and is housed in standard 24-inch deep panels. Practically all parts are interchangeable with those from Swartwout single-pen recorders. A compact instrument, the recorder contains two separate but identical signal amplifiers and pen-actuating mechanisms on a single chassis. A special mechanical interlocking arrangement prevents the recorder from being removed from the case while power is on.

Instrument sensitivity is 0.1 per cent or better, and the instrument is accurate to $\pm\frac{1}{2}$ per cent of full scale. The strip chart is driven by a dual sprocket and is easily rewound to examine past records without breaking chart continuity or tearing the chart.


These four "ACCELATORS" process 140,000,000 gallons per day better in less than half the area previously required for old facilities rated at 72,000,000 gallons per day.
Consulting Engineers
BURNS & McDONNELL ENGINEERING CO.
Kansas City, Mo.

OMAHA CHOOSES INFILCO EQUIPMENT for World's Largest High-rate Water Treating Plant

... saves hundreds of thousands ... doubles production in half the space with latest ACCELATOR® clarifying units

The Metropolitan Utilities District of Omaha and their Consulting Engineers, Burns & McDonnell, selected solids-contact units for the treatment of Missouri River water because extensive studies and evaluation of competitive bids proved that ACCELATOR® units provided the greatest capacity in the limited space available.

Each "ACCELATOR" basin is 120′ in diameter by 27′6″ deep. Each is guaranteed to produce high quality effluent at minimum chemical cost and have a capacity of 35 m.g.d. with water temperature above 65° F. or 20 m.g.d. below 35° F.

Performance tests have demonstrated that each "Accelator" unit will clarify 41 m.g.d. with water above 65° F. and at least 31 m.g.d. with 35° F. water—using even less chemicals than were indicated in laboratory jar tests; and produced effluent turbidities substantially less than 10 ppm. Subsequent operation under hardness reduction conditions has produced even better results.

These are typical of the results being obtained in more than 2500 "ACCELATOR" installations, treating every type of water for municipal and industrial use. For more complete information write today for Bulletin 1825-D.

Inquiries also invited on coagulation, precipitation, sedimentation, filtration, flotation, aeration, ion exchange and biological processes.

INFILCO INC., General offices — Tucson, Arizona
Field offices throughout the United States and other countries

INFILCO

Eminence in design for water, sewage and waste treating and processing equipment... since 1894

New! BADGER Read-o-Matic* REGISTER

adds speed-reading to water metering

Here is the industry's first practical outdoor register — the Badger Read-o-Matic. Now meter reading routes can be completed in half the time — with no more wasted calls. Plus other important benefits such as:

• *No more "lockouts"* • *No more in-house accidents* • *No more access problems* • *No more inconvenienced customers*

The new Badger Read-o-Matic means a modern meter reading system that your water department can have now — and opens a whole new realm of possibilities for the future. You'll want to read about them in our free new Badger Read-o-Matic folder.

*Pat. applied for in U. S. A. and foreign countries

Badger Meter Mfg. Co. • 4545 W. Brown Deer Rd. • Milwaukee 18, Wis.

News of Suppliers

Neptune Meter Promotions

Neptune Meter Co., New York, N. Y., has announced the following reassignments and promotions in their sales organization.

Middle Atlantic Districts—The Philadelphia Office, under the direction of recently appointed branch manager G. W. Moore, has been moved from 1420 South Penn Square to new and larger quarters at 7 Bala Avenue, Bala-Cynwyd, Pa. A revision of sales territory covered by this office includes Pennsylvania, Delaware, Maryland, Virginia, West Virginia, and Washington, D. C. Mr. Harry Siebert will handle water, industrial and petroleum meter sales in Virginia, Delaware, Maryland and Washington, D. C. Mr. H. A. Lentz will sell industrial and petroleum meters in Pennsylvania, and water meters in the Philadelphia area. Mr. Russell Rutan's territory includes all of West Virginia, and portions of Virginia and Maryland, where he will sell Neptune meters. Mr. Ed. Game will handle Superior Gas meters in Pennsylvania, Delaware, Maryland, Virginia and West Virginia except for certain areas.

Mr. Jow Vetromile's selling area now includes central and western Pennsylvania where he will sell water meters.

Kansas City, Mo.—John F. Sanders has been promoted to the position of Assistant District manager for the North Kansas City office, and will be responsible for supervisory assistance in directing sales, in the States of Missouri, Kansas, Iowa and Nebraska.

North-West—Charles Alden has been appointed branch manager of the Portland, Oregon office and will be responsible for all activities of the company throughout the Northwestern and Western region of the U.S.

San Francisco—Mr. G. King Kells, has been appointed manager of the San Francisco-Bay area branch and will headquarter in Millbrae, Calif. Mr. Kells will cover the counties of Northern California.

Infilco Acquires Gale Separator

Infilco Incorporated, Tucson, Arizona, has announced the acquisition of the Gale Separator Co. of Bloomfield, New Jersey.

The Gale Separator company was organized 25 years ago, and its activities will be continued and merged with Infilco operations in the field of coolant and cutting oil cleaning and recovery.

The Coolant and Cutting oil cleaning division of Infilco is under the management of Mr. Leslie L. Fowler.

B-I-F Appoints Sales Engineers and Representatives

B-I-F Industries, Inc., Providence, R. I., has announced the following appointments of Sales Engineers and Representatives:

Chicago—W. Stuart Caton, Prairie Village, Kansas, and formerly of Cranston, R. I., has been appointed Sales Engineer, Chicago area. He transferred from sales and service in the Milwaukee territory.

New York City—Robert J. Niejadlik, New Hyde Park, N. Y., has been appointed a Service Representative

for the New York Office. He recently completed an intensive training course in Providence, R. I., and will service all B-I-F equipment.

Minnesota—Plant Equipment, Inc., Minneapolis, Minnesota, has been appointed sales agent for the state of Minnesota, exclusive of Clay County. They will serve Industrial and Petro-Chemical Plants.

Cleveland—George A. Horlacher, Cleveland Heights, Ohio has been appointed a regional engineer, utilities, in the Cleveland area.

Milwaukee—Richard G. Druger, Pewaukee, Wis., has joined the sales staff, and been assigned as a sales engineer for the Milwaukee office.

North-West Area—Instrument Laboratory, Inc., Seattle, Washington, has been appointed sales representative for the states of Washington, Oregon, Idaho, and Alaska.

Buffalo—John Z. Buckley, Providence, R. I., has been appointed Sales Engineer for the Buffalo, New York Office.

Lee Is Named To Honeywell Systems Engineering Post

Minneapolis-Honeywell Regulator Company's Brown Instruments Division, Philadelphia, Pa., has announced that Warren W. Lee has been appointed eastern region sales supervisor for systems engineering.

He joined Honeywell in 1950 and served in various capacities prior to his present assignment. He succeeds J. T. Teed, who has been named petroleum instrumentation market manager.

Lee was graduated from Oklahoma A. & M. in mechanical engineering and from Harvard's Graduate School of Business Administration. During World War II he served five years with the Army Corps of Engineers, attaining the rank of major.

Dorr-Oliver Opens Office in Pittsburgh

Dorr-Oliver Incorporated, Stamford, Conn., has announced the opening of a new office at 4209 Clairton Boulevard in Pittsburgh, Pa.

The new office will service the western portions of Pennsylvania, New York and West Virginia.

Richard N. Sibley of Eastern Industrial Division and Donald R. Vaughn of Eastern Sanitary Division are on the staff of the new office.

Preload Opens Midwest Office

The Preload Co., Inc., New York, N. Y., has announced the opening of its Midwest District Office at 711 Perimeter Road, Kansas City, Missouri. Mr. Fred M. Stinton has been appointed District Manager and will be in charge of this new office.

Alabama Pipe Opens Calif. Plant

Alabama Pipe Co., Anniston, Ala., has announced the opening of its newly built multi-million dollar plant at South Gate, California.

The plant, located on a 12 acre site seven miles southwest of Los Angeles, will have an annual capacity of approximately 25,000 tons output. It is claimed to be the most modern of its kind in the country. Soil pipe, and a complete line of standard fittings in all popular sizes are produced, employing the latest labor and time-saving devices. From South Gate will be handled the distribution of the firm's products in California, Nevada and Arizona.

Production at the new plant is concentrated on 2", 3" and 4" APCO

CONTINUED ON PAGE 35A

Here's the big news behind the industry's first practical outdoor register

The Badger Read-o-Matic is powered entirely by the meter to which it is attached . . . works on an exclusive "pulse" principle. As water flows through the meter, the generator sends a pulse by wire to the Badger Read-o-Matic register outside for accurate recording.

Like our Badger meters, the Badger Read-o-Matic is precision-engineered — thoroughly tested by our trained water meter experts in the laboratory and in the field. Badger Meter products are the result of over 50 years of *specialized* water meter experience — products that excel around the world in accuracy, durability, dependability and low maintenance cost.

Send for free, colorful brochure that tells you all about the revolutionary Badger Read-o-Matic. For an actual demonstration, see your Badger representative or write us direct.

Badger Water Meters

Badger Meter Mfg. Co. • 4545 W. Brown Deer Rd. • Milwaukee 18, Wis.

NEW
Advanced Design
LEOPOLD
AWWA
Rubber Seated
BUTTERFLY VALVES

- **Low Initial Investment!**
- **Bubble Tight Shut-Off!**
- **Long Life—**
  Low Maintenance!

Offering new, improved features plus simplified construction, Leopold Rubber Seated Butterfly Valves provide positive drop-tight operation year after year, with an absolute minimum of upkeep. They're built for maximum space savings and may be mounted in any position to suit individual conditions.

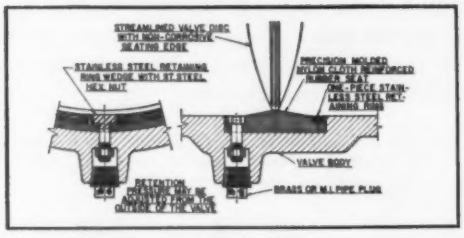
In this advanced design, a unique valve disc and rubber seat arrangement at the disc hub eliminates the major cause of premature seat failure. Only one moving part (valve disc) is in contact with the flowing medium, thus reducing wear and lowering the required operating torque. In addition, every Leopold Valve has a rugged flanged valve body, precision molded resilient rubber or synthetic seat, and heavy-duty corrosion-resistant operating parts.

Built in accordance with applicable AWWA specifications, Leopold Standard Butterfly Valves are available for line sizes 4"—48", with a choice of manual or various types of automatic operators.

For special control applications, LEOPOLD is equipped to furnish a specially designed, shop-tested, control package, which offers the advantage of full responsibility for the entire control system by a single reliable manufacturer.

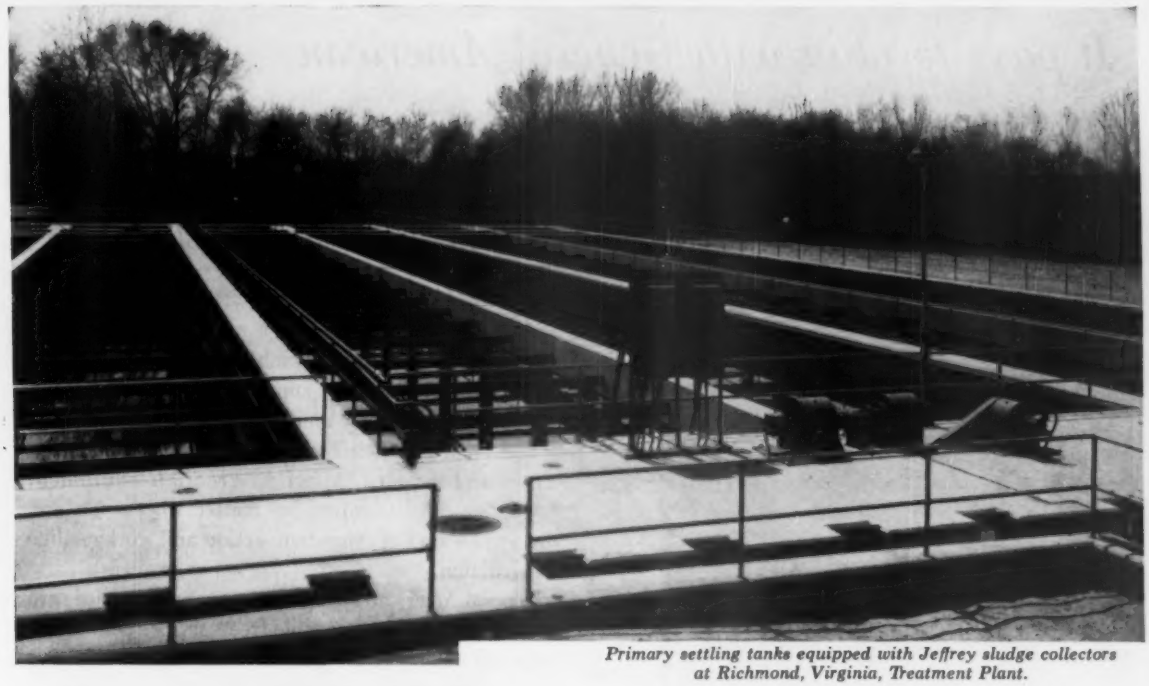
NEW, EXCLUSIVE "UNI-WEDGE" SEAT RETENTION

This unique construction allows seat retaining pressure to be adjusted externally with the valve in place in the pipe line. Only two seat retaining screws are utilized which are not in contact with the flowing medium, minimizing erosion and corrosion of the seat retaining mechanism. Eliminates the need for numerous small seat retaining screws inherent in most available valve designs.


STREAMLINED VALVE DISC WITH NON-CORROSIVE SEATING EDGE
STAINLESS STEEL RETAINING RING WEDGE WITH ST-STEEL HEX. NUT
PRECISION MOLDED NYLON CLOTH REINFORCED RUBBER SEAT
ONE-PIECE STAINLESS STEEL WEDGING RING
VALVE BODY
BRASS OR M.I. PIPE PLUG

Write today for Bul. No. 5603.58

F. B. LEOPOLD COMPANY
ZELIENOPLE, PA.



Primary settling tanks equipped with Jeffrey sludge collectors at Richmond, Virginia, Treatment Plant.

Jeffrey waste treatment plant prepares Richmond for 2000 A.D.

Jeffrey mechanically-cleaned bar screens with screenings grinders at Richmond plant. Grit is received from V-bucket type collectors, and washed by Jigrit washer.

Can a treatment plant, operating at optimum efficiency in 1958, be just as efficient in 2000 A.D.? The City of Richmond, Virginia, thinks it can:

New Jeffrey-equipped primary treatment plant satisfies current needs with a dry weather flow of 28 mgd. As designed by consultants, Greenley and Hansen, the plant may be easily converted to 70 mgd. secondary treatment, based on a population of 330,000 by the year 2000. Thus an intelligent, long-range plan provides Richmond with a system geared for today, yet fully adaptable to the more-than-double capacity needed for tomorrow.

Jeffrey's line of treatment plant equipment includes bar, disc and traveling water screens, grinders, collectors, washers, scum removers, feeders and FLOCTROLS (controlled flocculation). Catalog 905 describes this and other equipment for water, sewage and industrial waste treatment. The Jeffrey Manufacturing Company, 996 North Fourth Street, Columbus 16, Ohio.

JEFFREY

CONVEYING • PROCESSING • MINING EQUIPMENT...TRANSMISSION MACHINERY...CONTRACT MANUFACTURING

It pays to plan with General American

Any Required Capacity!
Erected Anywhere!

From its plants in Pennsylvania, Alabama, Indiana and Utah, General American supplies water storage facilities rapidly, efficiently and inexpensively.

The Field Erection Division maintains experienced crews and modern, efficient erection equipment throughout the country. No matter where you are, you are assured of immediate action and workmanlike construction.

General American steel reservoirs and standpipes are designed for lifetime trouble-free service. Our architects and engineers design exterior treatments to give them a clean modern appearance as well as utility.

Steel storage systems protect against cracks when settling occurs, are not damaged by the action of frost, are lightweight, porosity-free, cost less to build and less to maintain than other types.

Your inquiries are invited.

PLATE & WELDING DIVISION
GENERAL AMERICAN
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Plate and Welding Division

GENERAL AMERICAN TRANSPORTATION CORPORATION

135 South La Salle Street · Chicago 90, Illinois

News of Suppliers

CONTINUED FROM PAGE 31A

Sand Spun Soil Pipe, manufactured by the Herman Pneumatic Process. Other sizes up to 15" are available for shipment direct from South Gate to supply all West Coast Customers.

K & M To Erect New Facilities

Keasbey & Mattison Company, Ambler, Pa., has announced that work has begun on its major bulding program in Ambler which will provide it with a new office building as well as a modern research and development center, on its completion in mid-summer, 1959.

Completely air-conditioned, the new office building will house K & M's executive, financial, purchasing and statistical activities in two floors comprising 20,000 square feet.

Robert R. Porter, K & M president, revealed that the new R & D Center will be one of the most modern facilities of its kind in the industry, boasting such refinements as a thermal conductivity room; an artificial climate room for simulating a wide variety of climatic and weather conditions, as well as separate laboratories for individual product research.

MacDonald Represents Byers in Toronto

A. M. Byers Co., Pittsburgh, Pa., has announced that James A. MacDonald has been named company representative in Toronto, Ontario, Can.

Mr. MacDonald has been associated with MacDonald Process Equipment, Canadian Piping and Refining Specialties, Universal Plumbing and Heating, and Imperial Oil.

A mechanical engineering graduate of the University of Toronto, Mr. MacDonald served as first lieutenant in the Canadian Army.

He is a member of the Association

CONTINUED ON PAGE 41A

ELIMINATE YOUR WATER TREATMENT PROBLEMS WITH

Ferri-Floc

FERRIC SULFATE

FERRI-FLOC produces rapid Floc Formation — Controls Taste and Odors — Coagulates Over Wide pH Range — Increases Filter Runs — Removes Turbidity, Color, Manganese, Silical and Bacteria . . . Ferri-Floc is a free flowing granular salt that can be fed through most standard dry feed equipment . . . Ferri-Floc is easy to handle and will keep for long periods of time in closed hoppers.

WATER TREATMENT

Efficient Coagulation of Surface or Well Water—Effective in lime soda-ash softening — Adaptable in treatment of all industrial applications.

SEWAGE TREATMENT

Coagulates over wide pH ranges and provides efficient operation regardless of rapid variations of raw sewage — Very effective for conditioning sludge prior to vacuum filtration or drying on beds.

COPPER SULFATE safely controls about 90% of microorganism normally encountered in water treatment plants efficiently and more economically than any other chemical.

SULFUR DIOXIDE is used most effectively for dechlorination in water treatment and to remove objectionable odors remaining after purification.

SULFUR DIOXIDE HIGHEST QUALITY SO_2

FREE BOOKLET

Let us send you without charge, a 38-page booklet that deals specifically with all phases of coagulation—just send us a postal card.

TENNESSEE CORPORATION

BIG AD CAMPAIGN WARNS OF GROWING WATER PROBLEM!

Urges local support for better water systems

CAST IRON PIPE RESEARCH ASSOCIATION OFFERS LOCAL PLAN-OF-ACTION BOOKLET

Here's help for you and everyone else directly concerned with the supply, treatment and distribution of water—help that will acquaint the people in your town with the vital importance of this growing problem.

On the opposite page you see the second in a series of advertisements, this one appearing in April *Reader's Digest*. Placed by the Cast Iron Pipe Research Association, these striking advertisements point out to Mr. and Mrs. America how much we depend on a good water system and why we can no longer take it for granted.

Similar advertising will appear regularly in *U. S. News & World Report, Nation's Business, Better Homes & Gardens, American Home* and *Sunset* magazines to carry this public service message to millions of civic leaders and homeowners.

FREE LOCAL HOW-TO-HELP BOOKLET

These ads offer a free booklet telling about the water problem. It shows how responsible citizens can acquaint themselves with the needs of their community. It also gives a step-by-step outline of action, telling how they can help their officials extend and improve the local water system through more adequate rate structures or financing.

Let us send you a free copy of this new booklet. Write to Thos F. Wolfe, Managing Director, Cast Iron Pipe Research Association, 3440 Prudential Plaza, Chicago 1, Ill.

THREE REASONS WHY CAST IRON PIPE IS *AMERICA'S GREATEST WATER CARRIER:*

1. More miles of underground cast iron water mains are now in use than of all other kinds of pipe combined.
2. More miles of cast iron water mains are now being purchased and laid than of any other kind of pipe.
3. Impartial surveys prove that today's consulting engineers and water utility officials prefer cast iron pipe for underground water distribution by an overwhelming majority.

CAST IRON PIPE

Reader's

Oh, what will you do without water?

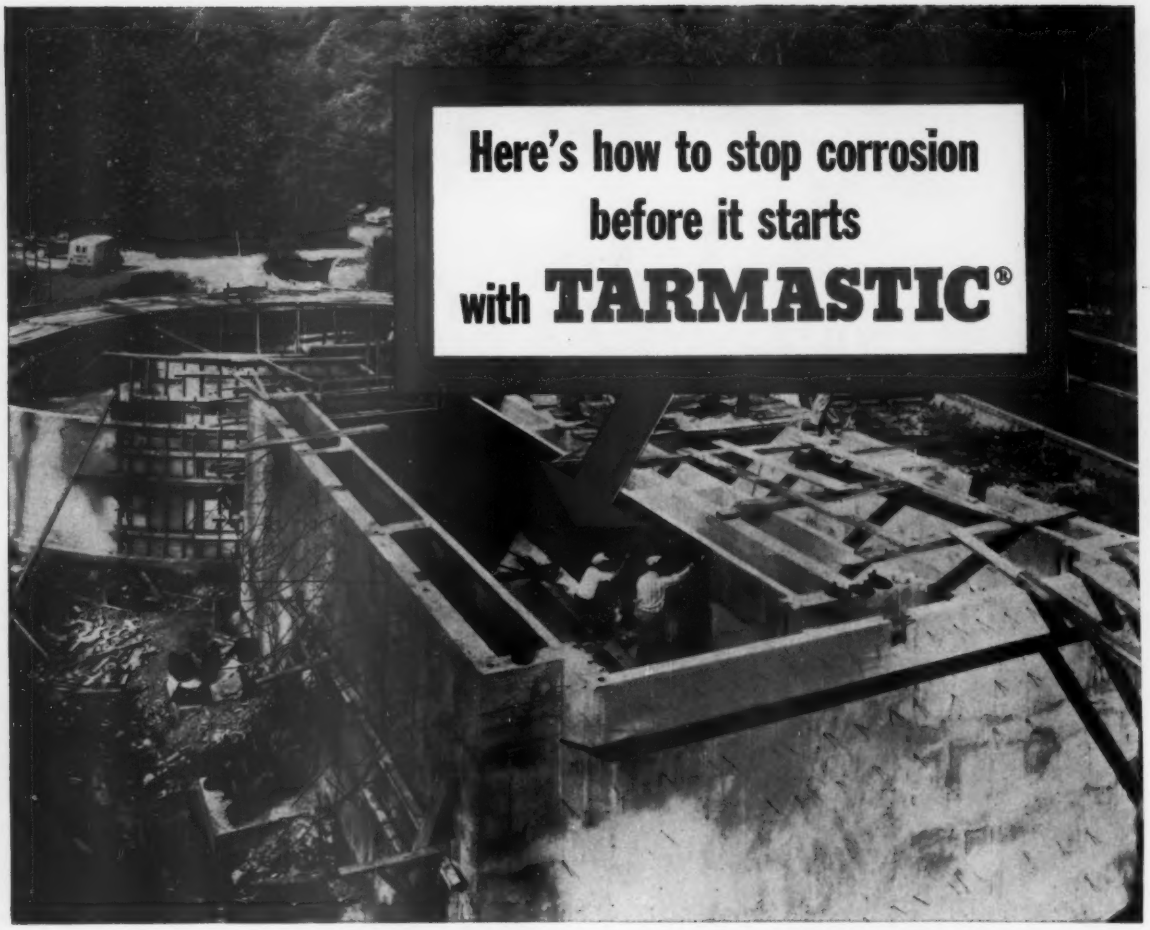
You mean there's a shortage?
Indeed there is. In the last five years over 1000 U. S. communities have had to ration water. It's growing less plentiful all the time.
Will *you* run dry? It depends on you.

Now, what can you do about water?

This free booklet, "*WATER—make sure you'll always have plenty,*" tells how to learn if you're running short, what to do if you are. Write Cast Iron Pipe Research Assn., Prudential Plaza, Chicago 1, Ill.

Printed in your interest by the makers of America's greatest water carrier . . .

CAST IRON PIPE



USE durable, heavy-duty *coal tar* coatings and you take the gamble out of protecting your water treatment and sewage disposal equipment against corrosion.

That's why more and more water and sewage engineers are specifying Pitt Chem TARMASTIC Coatings (formerly Pitt Chem 100 Series Coatings) for sure, economical protection of their facilities.

These tough, durable coatings—ranging from Tarmastic 101, a super heavy-duty formulation, to TARMASTIC 104, for use in potable water handling equipment—are virtually impervious to raw sewage acids, alkalies and moisture. They are easy to apply by brush, spray or roller over iron, steel and concrete.

If you want to stop water and sewage corrosion for keeps—reduce costs in the bargain—then call your Pitt Chem Industrial Coatings Distributor for more information on TARMASTICS.

* * *

PITT CHEM Industrial Coatings are available through leading Industrial Distributors. See the "Yellow Pages."

Corrosion Spots Like These Call for TARMASTIC® Protection

- ★ Concrete Surfaces
- ★ Concrete Pipe
- ★ Digestor Dome Interiors
- ★ Structural Steel Parts
- ★ Trickling Filters
- ★ Sludge Drying Beds
- ★ Steel Pipe
- ★ Settling Tanks

WBW 7483

PROTECTIVE COATINGS • COAL CHEMICALS • PLASTICIZERS • ACTIVATED CARBON • CEMENT • COKE • PIG IRON • FERROMANGANESE

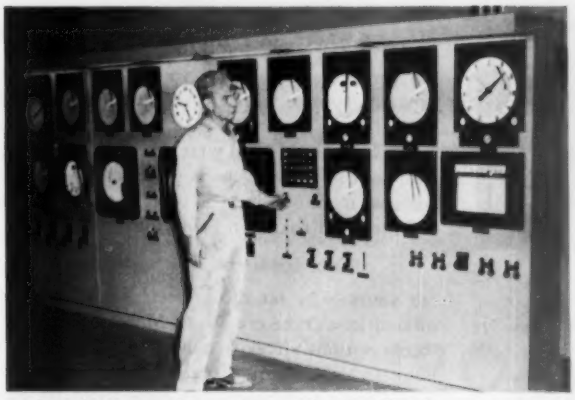
COMPLETE LINE OF CONTROLS

Pneumatic, electric, electronic . . . manual to fully automatic control systems

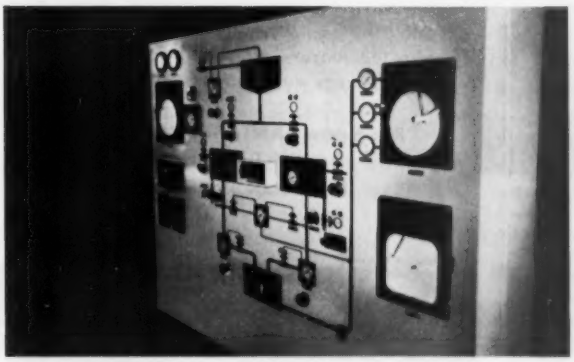
COMPLETE SERVICES

from planning through maintenance are Honeywell "extras."

Manual-pneumatic control system at the Springfield, Ohio, water treatment plant. Black & Veatch, Kansas City, Mo., consulting engineers. G. E. Tillman Co., Inc., Centralia, Ill., general contractors.



Pneumatic-sequencing system at the Fort Hood water treatment plant near Belton, Texas. Freese, Nichols & Turner, consulting engineers. Merritt, Chapman & Scott, general contractors.



Automatic-graphic system at the McAlester, Okla., water treatment plant. Collins & Flood, McAlester, Okla., consulting engineers. Brewer & McMichael, Inc., Holdenville, Okla., general contractors.

Complete services are important extras you get with Honeywell instrumentation. In planning your water projects, you can gain many advantages of these services right now . . . even if your plans are in the pre-blueprint stage. Honeywell services continue through installation of your controls, and long after startup. Here are three ways Honeywell helps you:

THE RIGHT SYSTEM FOR YOU

Honeywell makes *every* basic type of control system, and thus can recommend without bias the very best system for your particular needs. These recommendations are confirmed by product designers, service consultants, and application engineering specialists.

INSTALLATION ASSISTANCE

Honeywell's factory-trained installation specialists can completely install your entire control system, or, if you prefer, supervise installation and startup. Complete operating instructions and service manuals are always provided. Your operators can be trained at Honeywell's tuition-free Instrumentation Education Center.

SWIFT HELP IN EMERGENCIES AND PERIODIC SERVICE

Honeywell has the largest instrument service organization in the world. With a Periodic Service Plan, regular preventive maintenance keeps your instruments in perfect condition. Should an emergency arise, a Honeywell service engineer is always close by.

This is just part of the Honeywell service story. Your nearby Honeywell field engineer will be glad to fill in the details. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

Honeywell

First in Control

THEY'RE HERE!

all-new BANTAM 350's

UP go capacity and earnings to all-time highs in the ⅜-yd. field!

NEW BANTAM CRAWLER has stronger, more rigid car body with two side frame sizes, standard and long, for extra stability on crane work to eight tons . . . wide base extensions and high-clearance side rails. BANTAM C-350 also features full-reversing, 2-speed travel transmission and new in-cab digging lock. New, long-boom back hoe has deep 18'10" digging depth. 7- and 8-ton capacity.

NEW BANTAM SELF-PROPELLED brings new versatility and income potential to this class. Optional 4 x 4 drive . . . new automotive-type power steering . . . independent travel, swing and hoist plus faster travel speeds . . . new bypassing box-beam outriggers for all-around stability. It's the most maneuverable, most capable rig of its kind and it has full 11-ton capacity!

These new BANTAMS are the most productive and *most proved* crane-excavators in their size ever offered. So much so, they perform and earn far above their class!

The new 350 series advances the already amazing BANTAM work scope by literally hundreds of additional jobs! You'll handle more jobs, bigger jobs, tougher jobs, trickier jobs — all faster, easier, more profitably. New, increased power (gas or diesel) . . . new, increased line pulls . . . new, speeded work cycle with instant-acting, trouble-free mechanical controls . . . new, longer crane booms (to 70') and deeper digging back hoe (to 18'10") — all these and more assure the greatest operating ease and production ever achieved in a machine anywhere near its popular size.

4 BANTAM-built new carriers

No compromise in what you want in carrier capacity or price with a BANTAM! BANTAM builds its own carriers matched to the Model T-350 basic unit for all your work requirements. You have a 4-carrier choice — exactly what you want for more of what you need in performance, stability, and road and field ability.

Most features and options

It's yours — by far the greatest flexibility ever offered in a crane-excavator. More than 25 different options virtually make you "designer" of your BANTAM strictly to your own work needs. Three types of boom hoists (one standard, two optionals) . . . power load lowering for all models . . . gasoline, diesel, LP-gas or electric drives . . . torque converter . . . 2-speed transmission . . . wide counterweight choice up to 5000 lbs. . . . house-type or all-vision cab . . . plus lots more — all in addition to 11 different quick-change attachments, *all BANTAM-built!*

Put a new BANTAM through its paces now at your BANTAM distributor's. See him now or write factory.

211

SCHIELD Bantam Co.

303 PARK ST., WAVERLY, IOWA

World's largest producer of truck crane-excavators

News of Suppliers

CONTINUED FROM PAGE 35A

of Professional Engineers of Ontario, National Association of Corrosion Engineers, and Toronto Builders Exchange. His office is at 11 Yorkville Avenue in Toronto.

Mr. MacDonald lives with his wife and children at 47 Dunlue Road in Toronto.

Fischer & Porter Promotes Russell

Fischer & Porter Co., Hatboro, Pa., has announced the promotion of Harold L. Russell to Assistant General Sales Manager. In this position he will coordinate and supervise the marketing activities of the company's four divisions.

Mr. Russell has been Eastern Regional Sales Manager for the past two years, with a background of ten years in all phases of the instrument industry. He is an electrical engineering graduate of the University of Pennsylvania and is a member of the Instrument Society of America, the American Institute of Electrical Engineers and the Institute of Radio Engineers.

De Laval Forms Foreign Co.

De Laval Steam Turbine Company, Trenton, N. J., has announced the formation of a wholly-owned international subsidiary company under the name of Compania De Laval Turbine Internacional, S. A. The main office of the new company will be in Panama, R. de P.

The new company will coordinate and promote the sales and servicing of De Laval products throughout the world, except the United States, Canada, Hawaii and Puerto Rico. Mr. Richard Cahill, of Panama, is president of the Corporation.

De Laval also announced the formation of De Laval Turbina de Mexico, S. A., a subsidiary of the Panamanian company, with headquarters in Mexico City, D. F. Mr. J. P. Stewart, of Trenton, is president and Mr. Richard M. Cueto is sales manager.

ONLY FROM KUHNS

DUCTILE

IRON PIPE FITTINGS

Kuhns long lasting ductile iron pipe fittings for high strength and corrosion resistance are pressure rated by Underwriters' Laboratories, Inc. Most types and sizes are stocked for prompt delivery, along with our complete line of high quality cast and malleable iron fittings. Write for catalog today.

THE KUHNS BROTHERS CO.

1800 McCall St. • Dayton, Ohio

OVER 3,000 SHAPES AND SIZES

In our new plant (shown below)

HERSEY WATER METERS

are made by the most modern techniques and machines, from the automatic bronze foundry to the final test lines producing up to 7000 GPM of water.

Here is made the most complete line of Water Meters for every purpose.

HERSEY MANUFACTURING COMPANY

(Established 1859)

DEDHAM, MASS.

BRANCH OFFICES: NEW YORK — PORTLAND, ORE. — PHILADELPHIA — ATLANTA — DALLAS — CHICAGO
SAN FRANCISCO — LOS ANGELES

"You can't buy a better Water Meter than HERSEY."

Coordinating "Umpteen" different suppliers

...is costly to you and your consultants

Save Time, Effort, Money with "Teamed" equipment

A multitude of suppliers, each with a product for your project, means endless conference hours coordinating equipment designs, delivery schedules, erection services. It means many extra phone calls, telegrams, voluminous correspondence!

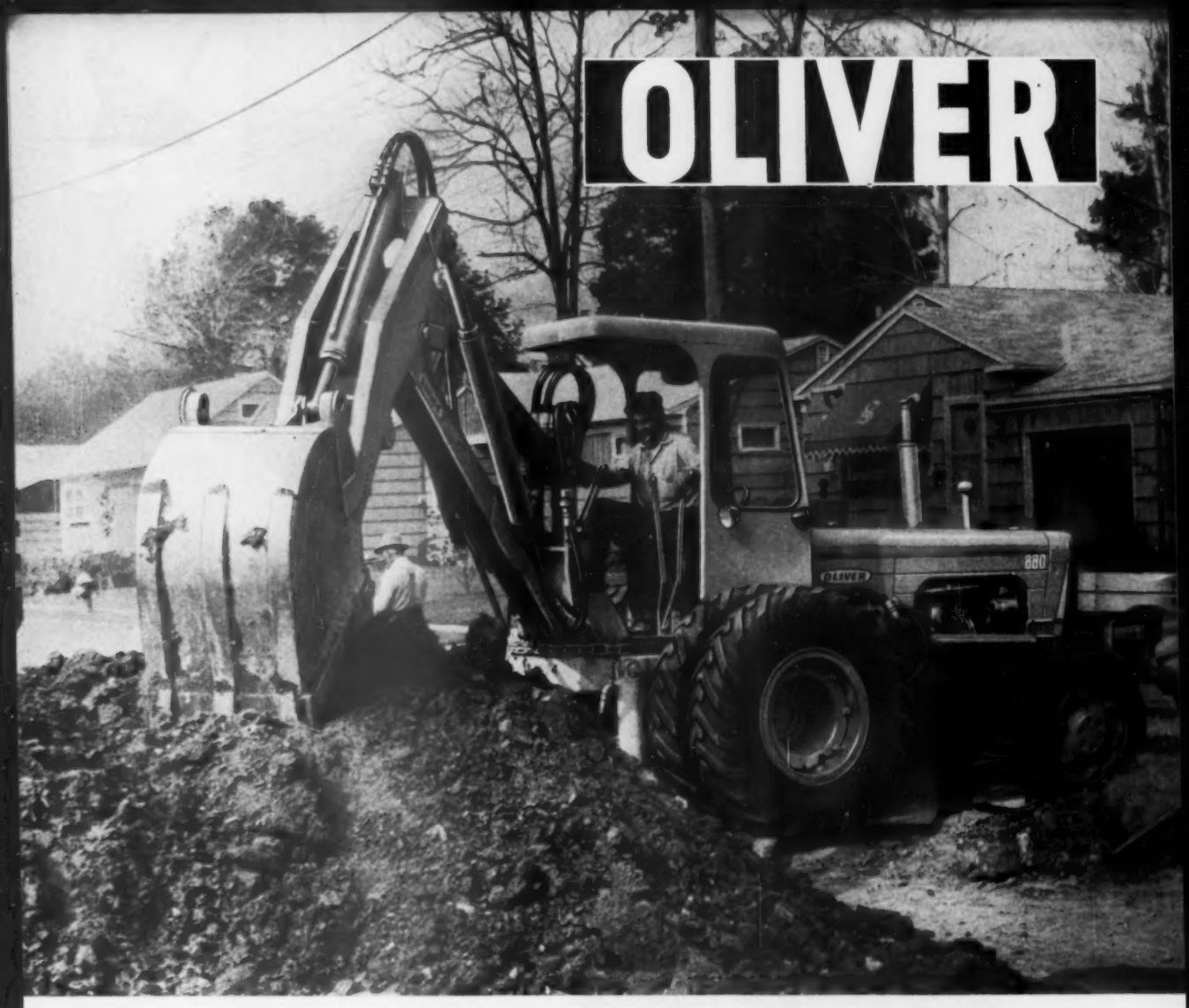
Here's an easy, efficient way to get most of the equipment for your project — pumps, motors, control, condensers, blowers, generators, etc. from *one source*. One inquiry and Allis-Chalmers public works specialists and product specialists coordinate all products to your project design and specifications. Allis-Chalmers assumes sole responsibility for equipment delivery and continuing field service. There's no "buck passing."

Cut out all the waste of time, effort and money involved in coordinating a multitude of suppliers by contacting your A-C representative—or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

"Teamed" Equipment from Allis-Chalmers — Pumps, motors, motor-generators, motor control, condensers, blowers, hydraulic turbines and generators, water conditioning, transformers, switchgear, butterfly valves, diesel engines.

ALLIS-CHALMERS A-C ALLIS CHALMERS

A-5989-PW



75% PRODUCTION BOOST WITH OLIVER 80-HT

—says New York contractor

The Oliver 880 tractor can also be equipped with a factory-matched 1-yd. bucket—making it a true heavy-duty loader. This unit is highly mobile, with travel speeds from 2 to 17 m.p.h. Gas or diesel power.

When this Oliver Model 80 Hydro-Trencher "took over" the job of digging 50-foot laterals in the rocky shale of Staten Island, Patsy Iaizzo, local contractor, happily noted two important benefits: 1. An immediate 75% increase in production over any of the three trencher combinations that he had been using. 2. A saving of at least $90 per month in fuel alone.

Savings like this are common among owners of this combination—the Oliver 880 tractor equipped with the Model 80 trencher. The ½-yd. bucket digs and loads to 12 feet. The boom swings 180° and the dual-circuit hydraulic controls allow raising or lowering the bucket while swinging. Result: faster work cycles. Now municipalities, utilities and contractors can rip out pavements, dig in hardest soils (even frozen ground)—and do these jobs with a unit that can travel anywhere on busy streets.

Your dependable Oliver distributor will gladly demonstrate—on your job. Call him today or write for literature.

OLIVER **THE OLIVER CORPORATION**

Industrial Division, 19300 Euclid Ave., Cleveland 17, Ohio

a complete line of industrial wheel and crawler tractors and matched allied equipment

Typical A-C pumping installation is this one in the District No. 2 Water Works at Pueblo, Colorado. Motors and control are also supplied by Allis-Chalmers.

From this cubicle comes advance proof of pump performance

This master control room of Allis-Chalmers pump test floor is far removed from public works installations. Yet, engineers working here know exactly what your needs are — and which Allis-Chalmers pump will best do the job.

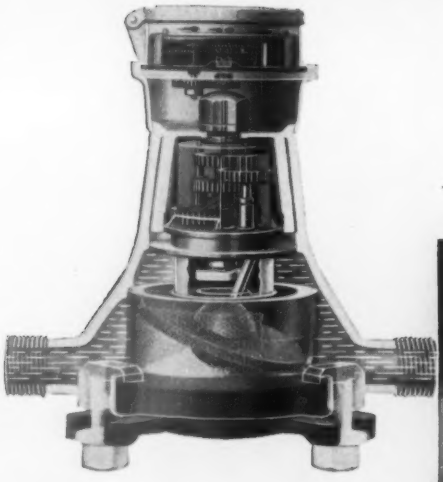
Suction heads, discharge heads, gpm capacity, required horsepower plus other essentials for satisfactory pumping performance are all proven in advance.

Performance testing like this is only one reason why A-C is recognized as a full-line leader in meeting the pump needs of municipals. "Teamed" motors and control; customized standardization of parts and materials; engineering assistance and nationwide service are others.

Whatever your requirements in centrifugal pumps — from the smallest to 250,000-gpm giants — contact your A-C representative or distributor. Or write to Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-5981-PW



HOW TO DEVELOP MORE *EFFICIENCY* IN YOUR METER SHOP

When a meter man learns one Trident, he learns them all. Instead of spreading his knowledge thin over many types and models of household meters, he can concentrate on the fine points of just one, and can quickly learn to do a job of which he can be proud.

Trident interchangeability is the big reason. Parts made for the most up-to-date Tridents are designed to fit into any older Trident of the same size and type. Reordering and stock control are simplified, too. No need to keep parts for many models. Just stock a small supply of the latest Trident parts.

You need never scrap a Trident because it is a "discontinued" model. In the process of replacing work-worn parts with new, improved parts over the years, you actually modernize all the Tridents in your system.

This 50-year policy of Trident is your best assurance that the modern Tridents you buy today will earn maximum revenue for your utility . . . with lowest yearly costs . . . for many years to come. Standardize on Trident meters. It pays in many ways.

It takes money to maintain the water supply your community expects. It's vitally important to make sure all the water pumped is paid for . . . by using accurate meters . . . and by keeping these meters in good repair.

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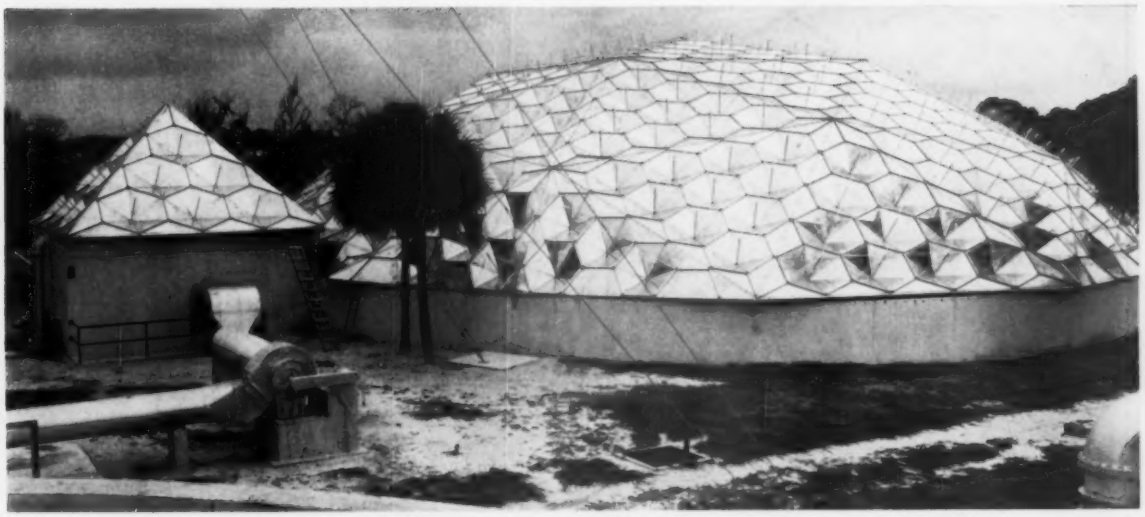
TRIDENT WATER METERS

Vol. 106, No. 4 · April, 1959

WATER & SEWAGE WORKS

A Scranton Gillette Publication



ODOR control at Sarasota, Fla., sewage treatment plant was accomplished by . . .

Geodesic Space Frame *over trickling filter*

by WYLIE W. GILLESPIE and ARTHUR J. BIRCHALL, respectively, Partner and Project Engineer, Smith and Gillespie, Engineers, Jacksonville, Fla.

AUTHORS' RESUME: The problem of controlling odors at the Sarasota Sewage Treatment Plant was solved by dilution of raw sewage to reduce the hydrogen sulfide content, and by covering the existing trickling filter, providing positive ventilation and venting the filter gases to a high point. A major reduction operating costs resulted from these modifications. A required increase in plant outfall capacity was provided by installing an effluent pump structure with unusual hydraulic characteristics.

■ THE SEWAGE TREATMENT plant erected by the City of Sarasota in 1949 functioned satisfactorily in the removal of 5-Day B.O.D. and suspended solids. Plant odors, however, caused many complaints over the years, including litigation with property owners seeking to recover damages for lowered property values. The outfall, built in 1949, was of 24 inch pipe, but was inadequate to carry flows over seven mgd. Flows of 12 mgd were experienced during 1956, causing the secondary clarifiers to overflow. Smith and Gillespie, Engineers, of Jacksonville, Fla. were retained in 1956 to study the situation and design such modifications as might be necessary to eliminate the overload and the odors.

Cause of Odor

The city water contains in excess of 900 mg/l of sulfate. The collection system, because of topography, contains long runs of gravity pipe on flat grades, numerous pumping stations and long force mains. This combination of circumstances resulted in delivery of septic sewage, supersaturated in hydrogen sulfide, through the force main to the plant. This hydrogen sulfide was released at every point of agitation.

During the litigation mentioned earlier, the City attributed a major portion of the plant odor to the trickling filter. The decision to cover the filter, therefore, was largely dictated by legal rather than technical considerations. The City can now demonstrate that any odors emanating from this structure are

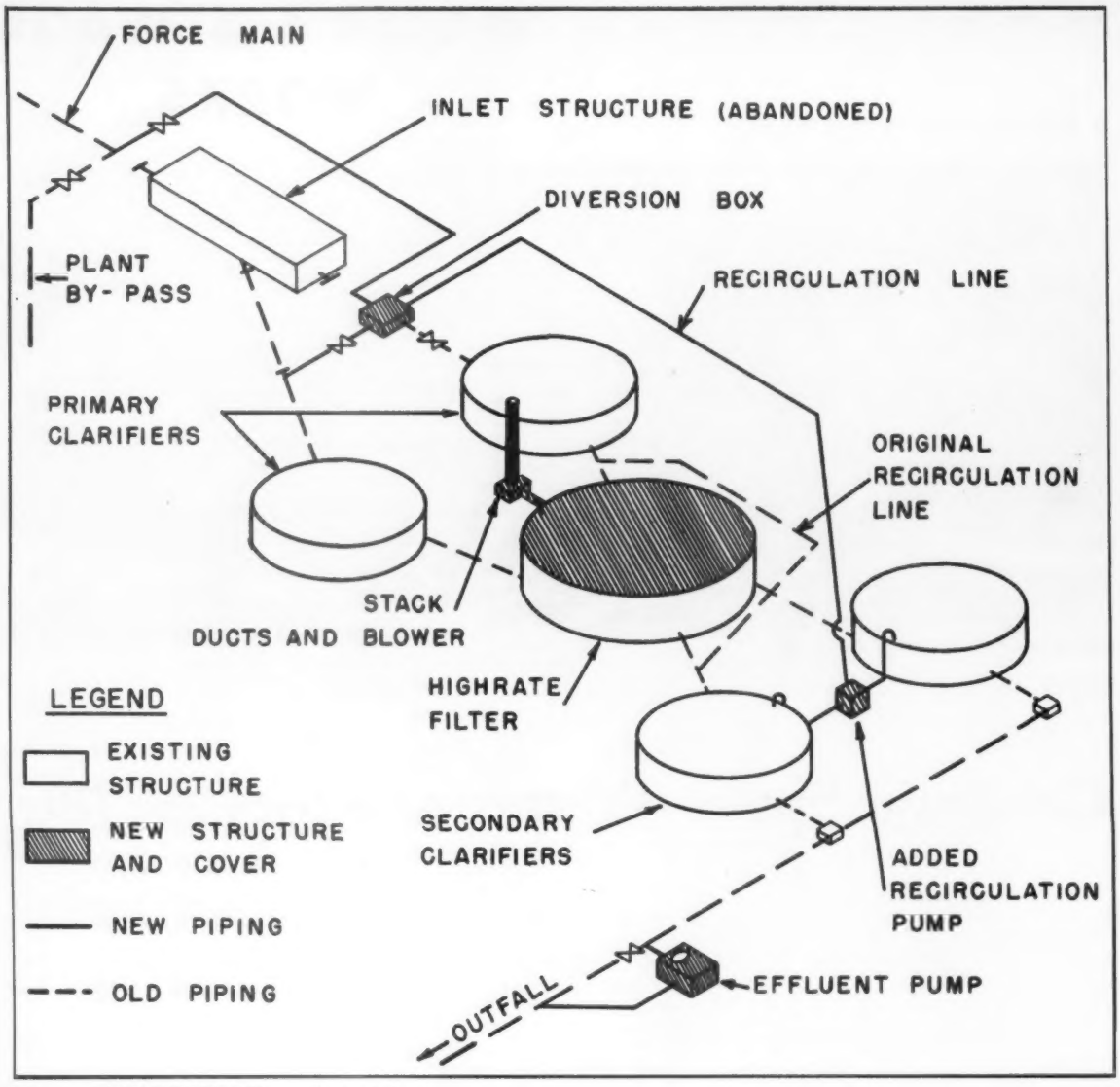


FIG. 1—MODIFICATIONS to plant piping.

positively collected and disposed of.

The technical correction of the odor condition involved:

(1) Abandoning the plant inlet structure, which included grit removal channels and plant metering by Parshall flume.

(2) Provision for preaeration in a covered structure to remove a major portion of the hydrogen sulfide for separate treatment and disposal and at the same time serve to remove the grit.

(3) Relocation of plant metering facilities in the plant outfall line.

(4) Construction of a diversion box to divide the flow to the two primary clarifiers and to receive the incoming raw sewage and recirculation flows.

Immediate Program

The construction program started during 1957 and completed early this year was a modification of the ultimate plans listed above to allow financing out of the operating budget. The plant inlet structure was bypassed, a diversion box constructed, an effluent recirculation pump installed, a geodesic space frame erected over the trickling filter and blowers, ducts and stack provided, a propeller type meter installed in the outfall line, and a plant effluent pump installed. These modifications are shown in Fig. 1.

Item two of the ultimate program was deferred until a later date. The duct work was designed to allow acceptance of the gases from a preaeration structure. Grit removal has been temporarily discontinued. It is planned to include this term of construction in an overall utilities improvement program for construction in 1959-1960. The major part of the modification work involved a coordination of construction with plant operating schedules. For this reason the City entered into a construction management type contract for all work except the actual space frame.

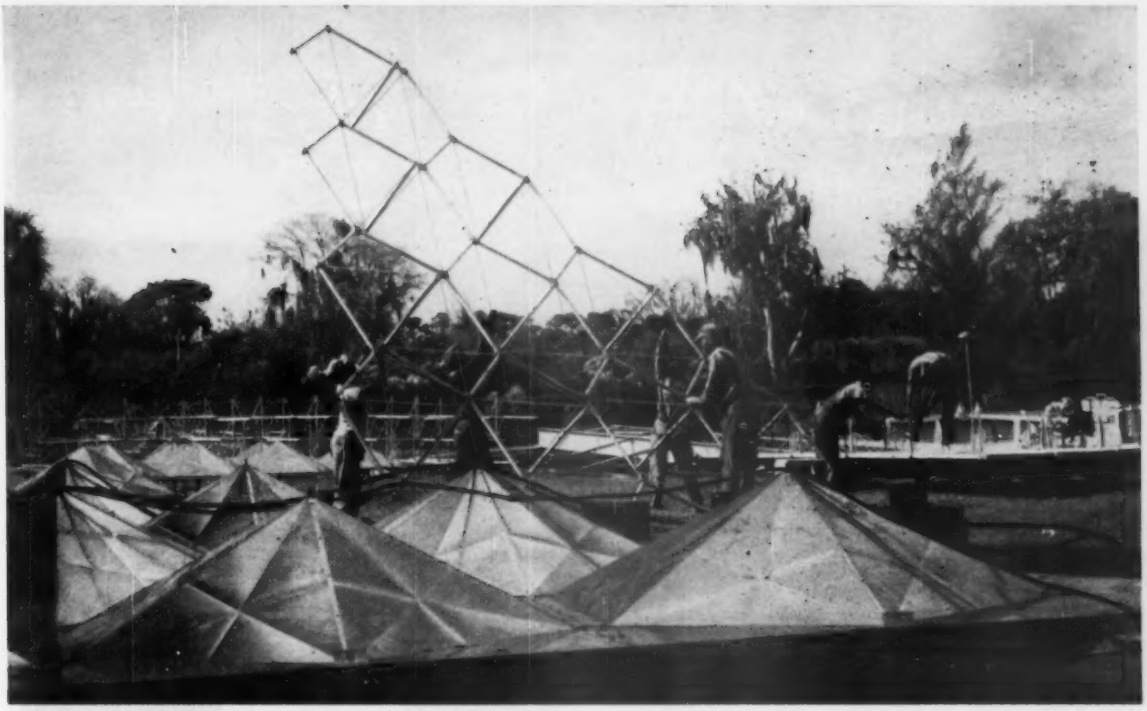


FIG. 2—SPACE FRAMES were assembled on the site.

The Saine Company, Inc., of Orlando Fla. was construction manager for the work and completed all phases at a cost approximately ten per cent under construction estimates. The diversion box, recirculation pump and piping, stack, duct work and blowers were all constructed by conventional methods without incident.

Geodesic Space Frame

The geodesic frame* was designed and erected by Jeffrey Lindsay and Associates of Beverly Hills, California. Dr. Richard Pomeroy of Pasadena, Calif. was a special consultant on the project. The frame is of aluminum and stainless steel with a membrane lining of dacron. The frame is purposely not sealed. Filter air is drawn into the structure through all joints of the outer structure and passes down between the membrane and the structure. The corrosive atmosphere over the filter cannot reach the metal parts of the structure. The geodesic frame was selected because it could be erected directly on the existing filter walls while subjecting them to a minimum of additional stress. Other methods of covering investigated included structural steel frame works resting on external foundations and on the existing wall, with the wall reinforced by tension bands.

The dome and pyramid shown in the accompanying photograph are made of identical components. Materials are entirely stainless steel and aluminum, fabricated to aircraft tolerances. Any size of cover can be made up with the space frame kit, and extra reinforcement of the concrete tank wall is not necessary. The frames bolt to special expansion brackets, which are in turn bolted to the wall. Access is through person-

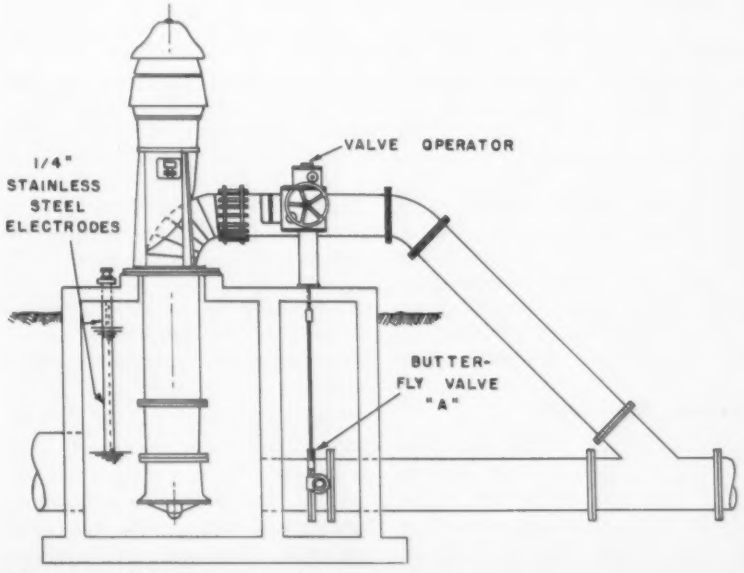
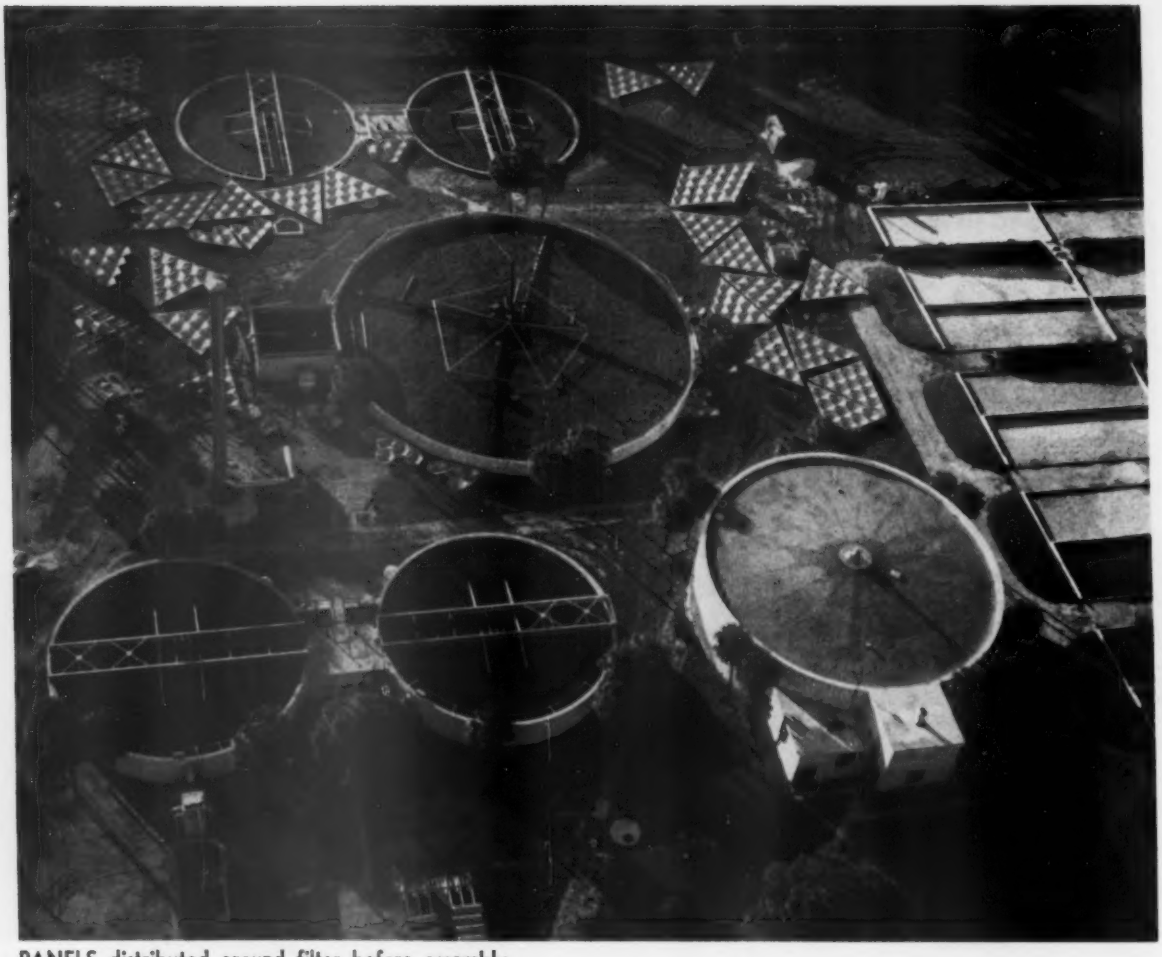


FIG. 3—EFFLUENT pump installation.

* Patent Rights for "Shell Truss" Space Frames are held by Jeffrey Lindsay



PANELS distributed around filter before assembly.

nel hatches, and larger maintenance openings are readily available by removing one of the panels (approximately 28 ft edge measurement, 285 sq ft, weight 300 lb) from anywhere in the structure. These panels are shown in Fig. 8. The dome is 112 ft in diameter x 27 ft high and covers 10,000 sq ft with 12,000 sq ft of space frame, volume 33,000 cu ft. The pyramid is 24 x 24 x 12 ft. high and covers 500 sq. ft. with 800 sq. ft. of space frame, volume 2,000 cu ft. Total cost for both space frames in place was $39,500 or $3.08 per sq ft of space frame complete.

Operating Experience

The plant odor problem has been solved. No complaints have been received since the completion of the project. The use of prechlorination for odor control has been discontinued and the savings in chemicals previously used for odor control will, in themselves, repay the cost of the modifications within a five year period.

The modified plant has not been in operation long enough to allow accurate evaluation of the effects of the changes. There appears to have been a material increase in the overall 5 day B.O.D. removal. The amount of chlorine fed to the effluent for disinfection has been reduced while maintaining the same residuals. This improvement in overall plant effectiveness may be attributed to the reduced sewage strength resulting from increased recirculation; and, as the sewage temperature and the air temperature are nearly equal over most of the year, the air supply to the uncovered filter, depending as it did on temperature differential, was often negligible. Now the filter operates with constant ventilation.

Effluent Pumping

The propeller pump installation is illustrated in Fig. 3. The planned operation included throttling valve "A" to allow back flow as required to satisfy the capacity of the pump. With valve A open, however, the effluent level reaches the pump starting electrode at approximately four mgd.

In practice the head losses into the effluent pit and pump column are such that, with valve "A" closed a syphon is established through the pump to the outfall and the level in the pit does not reach the pump starting electrode until the flow exceeds six mgd. The pump operates automatically at all flows and causes the syphon to be reestablished after each pumping cycle.

The modifications which have been undertaken at Sarasota, Fla. have removed problems which have existed for many years.

The theme of the midwinter meeting was . . .

Then is Now

A meeting report
by JAY S. GRUMBLING, Assoc. Editor

EDITOR'S NOTE: It was ironic that Wendell R. LaDue, as guest speaker at the one-day meeting, chose the subject "In Water Supply the Future is Always With Us" and the dark horse speaker, Larry Daniel, a director of the Cuban Section, AWWA spoke extemporaneously and enthusiastically on the future of Cuba.

Both speakers backed off from the day to day problems and pondered the questions: "How far is the future . . . Where does one go from here?"

■ PROGRAM CHAIRMAN Jack Diven opened the meeting by introducing Armand D'Angelo, Commissioner, Dept. of Water Supply, Gas and Electricity. Commissioner D'Angelo extended welcome greetings for New York Mayor Wagner and remarked on a number of projects underway. The city has allocated $10 million for capital improvement. Among projects mentioned were the Cannonsville, Croton Dam, Brooklyn to Richmond conduit and the Croton and Bronx River watershed sanitary surveys. Industrial and housing expansion in Westchester and Putnam Counties has created new demands and pollution problems on the city's water resources.

Larry Daniel, a Director of the Cuban Section, AWWA was in attendance at the meeting. Mr. Daniel is in the unique position of being a U.S. citizen but having spent his entire life in Cuba. He was called upon to give his first hand impressions of the situation developing in Cuba. Mr. Daniel stated that "Cubans have been living in a police state rather than a democracy . . . Cuba will make mistakes, however, but no one there need be afraid anymore . . . Everyone is now free to come and go anywhere on the island when they please." It is "fashionable to be decent and give fair play" and an accepted symbol that "the bearded ones mean honesty".

In answer to a number of questions, Daniel stated that free enterprize was advocated and that nationalization of the water industry was not thought a possibility. The professional man and American industry should have nothing to fear in Cuba as long as they conducted ethical business and not "monkey" business according to Mr. Daniel.

Mr. Laurence Handy Daniel is Pres. of Laurence H. Daniel, Inc., Baratillo 9 and Juztiz 21, Havana, Cuba. He received the Fuller Award in 1953 and is serving as a Director of the Cuban Section, AWWA for the 1957-1960 term.

■ IN WATER SUPPLY, THE FUTURE IS ALWAYS WITH US by Wendell R. LaDue, Chief Engr. and Supt., Bureau of Water Supply, Akron, Ohio.

This nation has a fixed water supply and an increasing population. Water supply systems with design capacities projected for 5, 10, 25 or more years into the future are now inadequate. "How far is the Future?"

"The sum total of all water on earth does not diminish in quantity, although the distribution may vary through the water cycle." Increasing population means a decreasing per capita availability which some economists consider the primary domestic question facing this nation today.

Is this nation faced with establishing priorities for users? Such conflicting demands, competition and pressures for available water resources will involve and require far reaching planning; demanding ingenuity in politics, economics, engineering, development, promotion and administration. Looking into the problems:

Water Laws—By custom, water "became subject to mutual understanding, which in turn developed common law concepts and doctrine such as riparian rights and prior appropriation." Other natural resources are not restricted to these essentially "personal" concepts but are considered on the "group" or "national" level. To effect this change with regard to the water resource will be a tremendous task but will be required if this nation is to sustain its ability to progress.

New Water—That water obtained from deep wells, not subject to recharge by surfaces sources, is the only truly "new" water.

Water Re-use—Essentially all water is of the "used" variety. By tradition the search is always for new not used water but by necessity the art of immediate reconditioning and re-use progressing. The Ohio Valley is an example of group progress.

Recharge—"Underground water basins are recharged either artificially by back-pumpage or naturally by flood irrigation of the well field.

Sea Water Conversion—Coastal areas may benefit greatly by this method. It has economic possibilities. Transportation will be a problem for inland areas.

Recreation—Water-borne diseases such as virus infections create a major public health menace in providing safe potable water from sources used for various recreational purposes.

Pollution Control—Wastes of new and varied character are being produced faster than treatment methods are found to satisfactorily dispose of them. Such water-borne wastes challenge the nation's ability to protect and improve the water resource for re-use.

LOCATED on the shore of the St. Lawrence River, modern design is feature at the . . .

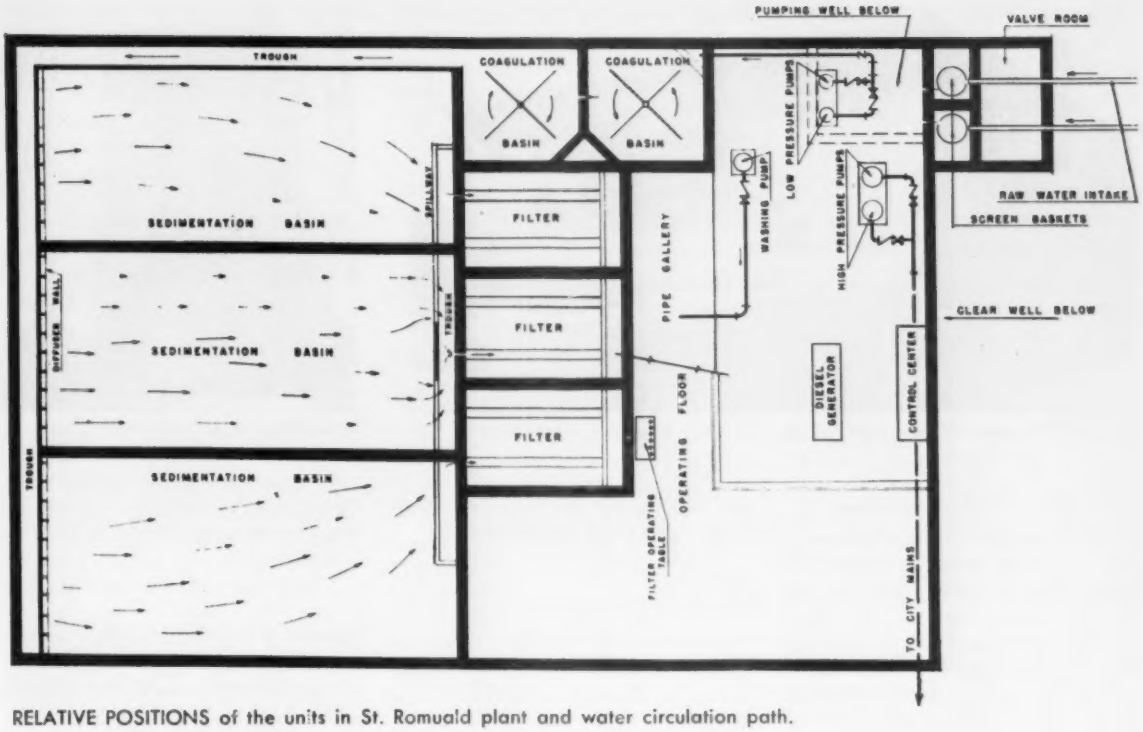
St. Romuald, Que. Filtration Plant

by MARC GILBERT, M.Sc.
Consulting Engineer,
Quebec, Que., Canada

EDITOR'S NOTE: Canadian practice in the design of modern filtration plants is exemplified by the water works for the municipality of St. Romuald d'Etchemin, a suburban town of about 5,000 population. The plant, which has a nominal capacity of 1 mgd can be expanded to 4 mgd to meet the needs of a population expected to reach 6,100 by 1975. The plant has been in operation about two years. This article describes the features incorporated in the design by the author. The photographs were supplied by E. T. Nesbitt of Quebec.

■ THE PLANT BUILDING has a brick facing. From the interior, through the large plate glass windows facing the river along the upper wall of the pump room, an excellent view of the intake area and ice conditions can be seen in winter. In summer the windows provide a magnificent panorama of the opposite shore and ships passing in the channel. This is a departure from the usual closed in and humid atmosphere of ordinary filtration plants and gives added compensation for the operators on duty.

The foundation of the plant is on bed rock and the suction well had to be dug at least 35 feet into this material. To insure watertightness, the thickness of the concrete walls of the basins was fixed at a minimum of 16 inches, the floors at 8 inches. As insulating material, perlite concrete blocks were used in the inside face of the walls. The roof was insulated



RELATIVE POSITIONS of the units in St. Romuald plant and water circulation path.

with 2 inches of fiberboard laid on the reinforced concrete slab.

The variation in levels of the different parts of the municipality is about 160 feet. It has been decided to meet all these conditions with only one pumping level for the moment. This policy may have to be revised to help develop some isolated higher level areas in the future.

Intake

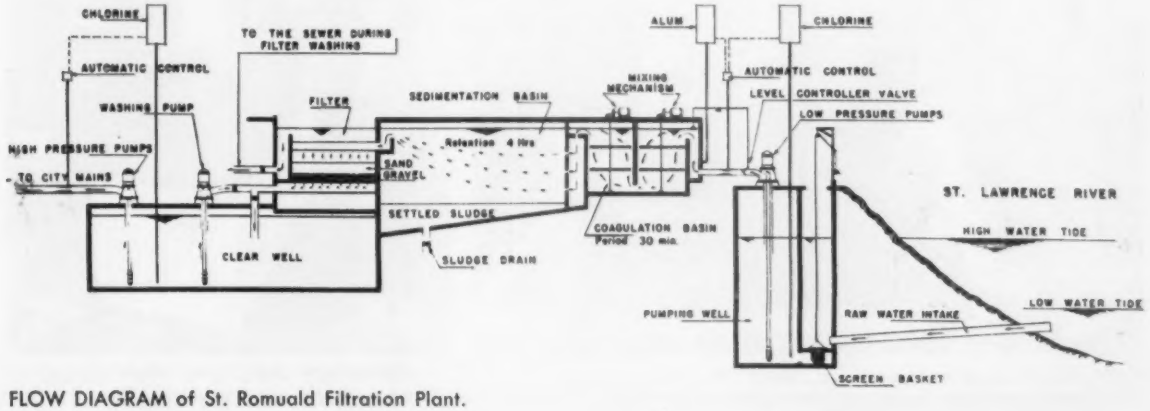
The intake is from the St. Lawrence River, the raw water flowing by gravity into a pumping well by means of two alternate 10 in. pipes, 320 ft long, allowing a velocity of 3 ft per sec.

Basket type screens and a special hand-operated lifting device has been provided at the pumping well to retain sea hay, fish and other objectionable materials.

Although there are baffle plates at the mouth of the intake pipes in the river, needle ice and other obstructions are likely to cause trouble at this point, which is almost inaccessible especially in the winter. To overcome this trouble, an arrangement of connections and valves in the valve room, ahead of the pumping well, has been devised to permit emptying the coagulating basins or one of the settling basins, causing a violet backwash sufficient to clear the mouth of the pipe of any obstruction. Experience in the operation of the plant has proved many times this installation to be well paid for.

An analysis of the raw water dated April 28, 1958, showed the following results:

Bacteria, on agar at	37 C	3,900
Bacteria, on agar at	20 C	3,400
Coliforms present in	0.1 ml	5/5
Coliforms present in	1.0 ml	5/5
Coliforms present in	10. ml	5/5
Coliforms present in	100. ml	2,400
Turbidity	28 mg/L	
Total hardness	70	
Incrustants	16	
Alkalinity	54	
Iron	0.9	
pH	7.7	



FLOW DIAGRAM of St. Romuald Filtration Plant.

FILTRATION plant as seen from the St. Lawrence River.

STANDPIPE has 1,000,000 gallon capacity.

Coagulation and Sedimentation

The design for chemical treatment was based on alum as coagulating agent using dry feed. The alum dry feed machine is of the volumetric type, automatically controlled by means of the venturi on the raw water line.

Two coagulating basins, built in series and of a size to permit a retention period of about 30 minutes, are equipped with agitators which consist in horizontal paddles fixed to a vertical axis. The velocity of rotation of the paddles is controlled by variable speed transmission, from a minimum of 1.1 to 5.5 rpm.

The three sedimentation basins were designed for a detention period of about 4 hr, taking into account a fair amount of sludge deposit. At the head of the basins, some hollow building type concrete blocks have been laid sideways to form a diffuser wall, the hollows being the orifices.

Filters

There are three filters, each is 10 x 14 ft, with 12 inches of graded gravel, topped by 24 inches of sand, having an effective size of 0.50 to 0.60 mm and a uniformity coefficient between 1.20 and 1.70.

Filter underdrains used are Miller blocks installed on ridges 10 inches high. With this arrangement it is expected to combine the simplicity of the Miller blocks with a good size plenum chamber, a principal advantage of the Wheeler bottom.

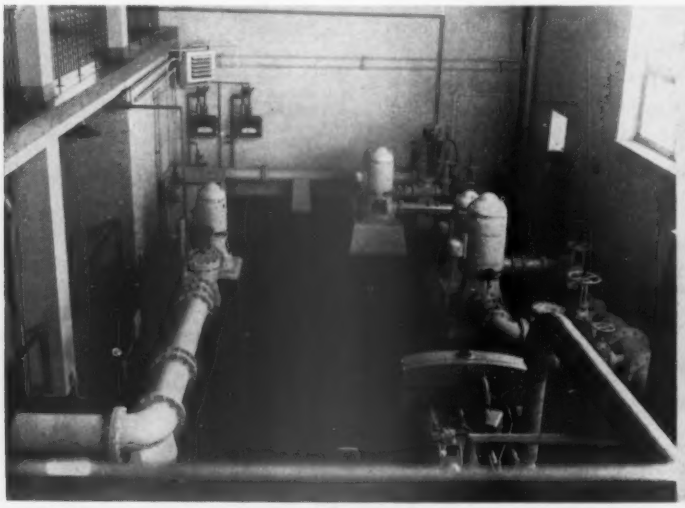
The Miller blocks were accepted although we are not in complete agreement with the designer about the angle of the concrete faces at the outlet of the porcelain orifices. We would like to see this angle more acute and less open to better keep the stones at a distance.

Wash water troughs were made of reinforced concrete with the lips levelled in place with an emery grinding wheel.

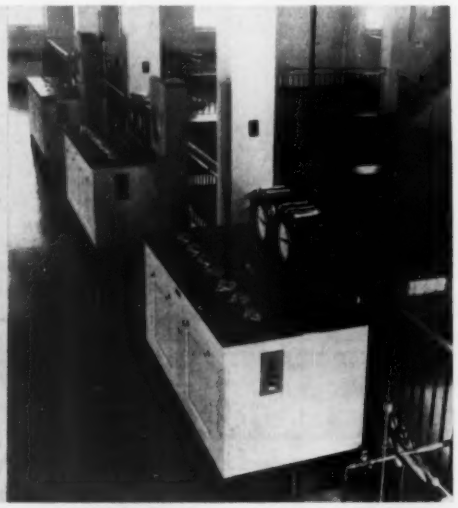
The surface wash system is used and utilizes two 3-inch copper mains, suspended to the wash troughs, with ¾ inch copper laterals having 3/32 in. orifices in twos, on 6 in. centers. With a pressure of 40 psi, a water consumption of about 1½ Imp gals per min, per sq ft is expected.

Control tables, in marble finish, include rate of flow and loss of head indicators and the following control handles operating hydraulic valves:

1) Filtered water to clear well
2) Raw water admission
3) Wash water admission
4) Wash water control



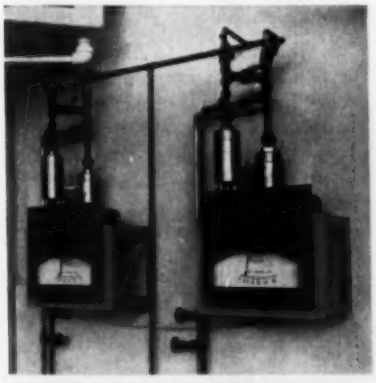
PUMP ROOM contains five vertical pumps (two high service, two low service, one wash water) and emergency generator.



OPERATING tables and filters located in room next to settling basins.

5) Wash water to drain
6) Filtered water to drain
7) Surface wash

The pipe gallery, designed watertight and tested accordingly, is sunk into the clear well, not only to permit a saving of space but also to obtain an arrangement where as much head as practically possible is provided above the sand bed, rather than being dependent on too much of negative head below the sand to maintain a constant flow. Too much vacuum is considered as a nuisance, likely to cause air introduction and air pockets under the sand bed, a condition we tried to do away with as much as possible. The arrangement made the filter boxes fairly deep, the water depth over the sand bed being 8 ft-9 in., this being the total positive available head, but the experience in operation has not shown that we were wrong.



CONTROL of chlorine feed is proportioned by rate of flow transmitters.

Filtration rate controllers are combined with a clear well control device, whereby the flow of filtered water is automatically throttled when the maximum clear well elevation is reached.

Wash water is controlled by the operator who is guided by a flow indicator dial gauge. A hydraulic butterfly valve is operated from the control table. A wash water rate up to 24 in. rise per minute may be obtained.

The water level in the basins is kept constant by a mechanism controlling an hydraulic butterfly valve.

Recorders and Signals

Rate of flow and pressure recorders with an integrator are installed with a venturi on the 12 in. distribution line outlet. On the raw water line, there is also a venturi connected to a flow recorder and integrator.

Warning signals are audible and visible. A special annunciator panel incorporated in the control center indicate the following operating hazards.

—Critical low water level of the suction well.
—Overflowing level of the clear water basin.
—Critical low water level of the clear water basin.
—High and low pressure in the distribution system.
—Low level in the coagulation basins.

Pumps and Reservoirs

All the pumps are of the vertical axis type. This decision has been taken to save space and avoid all ordinary priming precautions.

The pump capacities are indicated in the following table:

Use	Imp. gal/min	Head-ft	hp
Low lift	312.5	65	10
Low lift	625.0	65	20
High pressure	347.5	265	40
High pressure	695	265	75
Wash water	1750	33	25

Instead of crowding the floor with emergency and gasoline engine driven pumps, a generator of 100 K.W. capacity has been provided with all the electrical arrangement to permit the transfer of the load to this unit. The generator is operated by a standby diesel motor, started by a storage battery.

The clear water basin is located under the filters, the pipe gallery, and the pump room and has a capacity of 150,000 gal. This added to a storage reservoir of 1 mil gal, a standpipe gives a total storage capacity of 1,150,000 gals, which is considered a fair answer to the requirements for a population of about 5,000.

Chlorination

Double chlorination, pre- and post-, is used with a system of interconnections and valves to enable, in case of deficiency of one chlorinator, to transfer the total load to the remaining chlorinator.

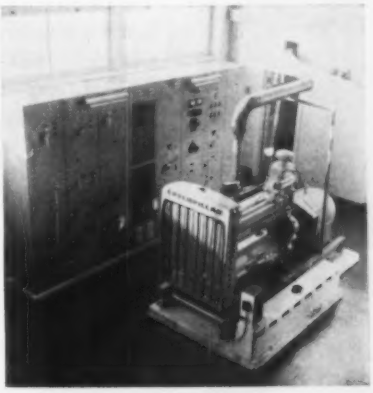
In the chlorine room, a fan has been provided to clear chlorine fumes at will. Both pre- and post-chlorination are controlled by proportioners acting with the venturis of the raw water line and the distribution line outlet. The chlorine is stored in the chlorinator room where there is no problem of space.

The alum storage room has been made adequate to receive one car load of alum, with space to spare.

Flow Diagram and Inspection Well

To better help visitors visualize the general principles of the plant operations, a flow diagram has been neatly drawn in oil color and framed on the wall. It is easier that way for the operators to answer the questions of the taxpayers.

An inspection well of the usual type, in terrazzo finish and covered with a plateglass framed in stainless steel, serves to show visitors as well as the operators the clear water quality and perfection. At the bottom of the clear water basin, visible through this glass, the blazon or crest of the municipality of St-Romuald d'Etchemin shows up very well, being neatly drawn in colored terrazzo. This item has already proved very valuable to the operators in helping to detect signs of imperfection in the treatment of the water and rapidly correct the causes of the trouble.



STANDBY generator is located near electric control center.

Building Cost Analysis

The total cost of the plant was $303,915.58, distributed as follows:

Land property	$ 9,500.00
The intake pipe lines	52,435.00
Excavation, backfill, earthwork	18,223.02
Basins and building	122,264.00
Mechanical and electrical equipment	101,493.56
Total	$303,915.58

The 1,000,000 gal standpipe cost was $57,500.00 including the foundation.

Suppliers

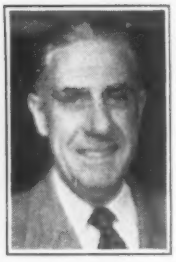
Standpipe	Toronto Iron Works
Diesel gen., Caterpillar	Hewitt Equip. Ltd.
Pumps	International Water Supply Ltd.
Control Center	Can. Westinghouse Ltd.
Chlorinators	Fischer & Porter Ltd.
Flow regulators and meters	B.I.F. Ind. Inc.
Alum feeder	Wallace & Tierman Ltd.

The retirement plans of Harry Jordan were one of the highlights at the American Water Works Assn., Board of Directors meeting, where the annual selection of . . .

AWWA Officers, Honors and Awards For 1959, *were made.*

■ The announcement of the retirement of Secretary Harry E. Jordan on September 1, 1959 and the appointment of Raymond J. Faust to succeed him, headlined the selection of officers at the annual Board meeting. The nominated officers for 1959 are:

President: Lauren W. Grayson, General Manager and Chief Engineer, Public Service Department, Glendale, Calif.



Vice President: C. F. Wertz, Director, Department of Water and Sewers, Miami, Florida.

Treasurer: William J. Orchard, Director, Wallace & Tiernan, Inc., Belleville, N. J.

The Board also elected four men to Honorary Membership:

Frank C. Amsbary Jr., Vice-President & General Manager, Long Island Water Corporation, Lynbrook, N. Y., Member of the Association since 1927; Life Member 1957; President 1956; Director 1939-42; Illinois Section Chairman 1934; Fuller Award 1941. A gentleman who combines courtesy with a high degree of executive competence, bringing great credit to the industry; one to whom the distinction of honorary membership brings evidence of well deserved appreciation.

E. Sherman Chase: Partner, Metcalf & Eddy, Boston, Mass. Member of the Association since 1919; Life Member 1949; Director 1944-47, 1956-59; Fuller Award 1949. Thoroughly devoted to Association activities and to the advancement of his fellow engineers; a living symbol of the modern New England spirit, who particularly merits the distinction of honorary member because of his long years of voluntary service in the fields of water supply and waste water control.

Morris S. Jones: Retired General Manager, Water Department, Pasadena Calif. Member of the association since 1924; Life Member 1954; California Section Chairman 1942; Director 1951-54; Fuller Award 1955. One who brought to the administration of the Pasadena water system a high degree of intelligence and who developed within his community a highly compatible relationship between the water utility and its customers.

Marsden C. Smith: Retired Chief Engineer, Department of Public Utilities, Richmond, Virginia. Member of the Association since 1925; Life Member 1955; Director 1937-40; Fuller Award 1940. One who brought to his city's water department many of the fruits of his inventive genius; One who brought to water supply practice many devices which represented a combination of his mechanical and electrical skills into useful components of modern water systems.

Fred Merryfield was awarded the DIVEN MEDAL for his outstanding and forceful leadership of the Association's ad hoc committee on public information, his continuing leadership as chairman of the Committee on Water Works Advancement and his energetic efforts to advance the industry and its personnel.

Louis R. Howson was awarded the 1958 GOODELL PRIZE for his paper "Factors Affecting Long-Distance Transmission of Water" as published in the October 1957 issue of the Journal. The selection of Mr.

Howson's paper was made because of the background of broad experience and objective engineering judgment displayed, plus the clarity of expression of ideas which make the paper possess great value to all persons who may study it in the future.

The committee considered three other papers to have high value; "Automation Developments in Philadelphia" by V. A. Appleyard —January 1958; "Carbonation of Water Softening Plant Sludge" by Fred A. Eidsness and A. P. Black —October 1957; and "Evaluation of the Use of Polyphosphates in the Water Industry" by T. E. Larson—December 1957.

Division Awards

The Division Awards are made annually, one for each of the Association's four divisions, for the paper considered by the Award Committee of each division to be the best paper published in the Journal in its field of interest during the year. The awards for 1958 are:

Martin E. Flentje, Robert J. Sweitzer, Distribution Division Award, for their paper entitled "Further Study of Solution Effects on Concrete and Cement in Pipe." This paper, published in the November 1957 issue of the Journal, continues the record of valuable studies made by the authors and gives the reader a substantially improved understanding of the factors which adversely affect concrete.

Alexander C. Rener, the Management Division Award, for his paper entitled "Developing a Safety Program for the First-Level Supervisor." This paper, published in the February 1958 issue of the Journal, gives support to the Association's safety program by making clearer the importance of the supervisor in establishing safety consciousness among the men who benefit most from the program.

Dwight F. Metzler, Russell L. Culp, Hower A. Stoltenberg, Richard L. Woodward, Graham Walton, Shih Lu Chang, Norman A. Clarke, Charles M. Palmer, and Francis M. Middleton, the Purification Division Award, for their paper entitled "Emergency Use of Reclaimed Water for Potable Supply at Chanute, Kan." In this paper, published in the August 1958 issue of the Journal, the growth of demand for water and the lack of sustained yield by streams upon which cities depend, are dramatized by the record of the extraordinary steps which had to be taken to provide this important Kansas community with water service during a severe drought.

Richard Hazen: the Resources Division Award for his paper entitled "Financing and Cost Allocation in Regional Water Systems." This paper, published in the September 1958 issue of the Journal, provides a clear account of the engineering studies required to develop a regional water supply and the financial studies which are required to make the project successful. The paper charts a path which many cities must follow to protect their future growth.

Section Awards

HILL CUP: The Nicholas S. Hill Jr., Cup is awarded for membership growth during the year, the award for 1958 went to the CALIFORNIA Section, which has a point score of 37.365. The Arizona Section was second with a point score of 33.600; and the Florida Section third with a point score of 28.424. Not eligible for competition during 1958, its year of organization, the Intermountain Section was awarded a special prize for its outstanding record of 58 members gained between March and December.

HENSHAW CUP: The Franklin Henshaw Cup is awarded annually to the section with the best attended meeting during the year, as measured by the percentage of the section's members present. The 1958 award went to the PACIFIC NORTHWEST Section which has a score of 75.0 percent. The Intermountain Section was second with 71.1 percent of its members present; and the California Section third with 63.8 percent of its members present.

Advancement Program

The 1959 Advancement Program approved by the Board represents the first implementation of the Advancement Committee's planning, and is expected to be a year of investigation, appraisal, and trial. The planned committee activities breaks down into two general headings: Professional Advancement Program and Community Relations Program.

Under professional advancement activities there are five proposals:

1. *Management Education Program*: To collect and disseminate to Section committees information enabling them to initiate their management programs during late 1959.

2. *Water Utility Management Quarterly*: To publish a water utility management bulletin quarterly, bound in the center of an issue of Willing Water along with order blanks for quantity orders.

3. *Personnel Services Investigation*: Collect information and investigate the activities of various professional, utility, and trade associations in the areas of personnel recruitment, retention, and services.

4. *Gain Support of Other Organizations*: The Committee is to study and participate in the activities of various agencies and associations to develop their support of the Advancement Program.

The following five points are made under the Community Relations Program:

1. *Hometown News*: The hometown new program is to publicize attendance, special events, elections, and awards at Section Meetings in the hometown media of the members. This will be implemented by a manual and the assignment of a professional writer during meetings.

2. *San Francisco Coverage*: Cover hometown and national media with convention news.

3. *Film Scenarios*: Two scenarios for use by local utilities in making their own films are to be professionally prepared.

4. *Community Relations Guides*: Publish as many brochures or booklets as possible on items of special interest to the water utility local programs.

5. *Liaison Activity*: The Committee will endeavor to obtain the cooperation of trade and national magazine advertisers in furthering the overall objectives of the program.

MANAGEMENT SYMPOSIUM

Water Works Management—Part II

EDITOR'S NOTE: At the 62nd annual meeting of the Penna. Water Works Assn., these were nine papers presented on various aspects of water works management. The program had been arranged by John Murdock, Jr. president of the association. WATER & SEWAGE WORKS is fortunate to obtain permission to publish slightly condensed versions of the nine papers as a three part symposium on Water Works Management. Three papers appear in this section.

The Profit Motive

by JOSEPH A. BECK, Attorney at Law, Pittsburgh, Pa.

■ THE PROFIT MOTIVE need not be defended, although it is as the theme of this discussion toward providing an understanding of the Profit Motive. To discuss the subject, it is first necessary to agree upon definitions. The definition of the word *motive* presents no difficulty. Its simplest definition is "a determining or compelling impulse" and therefore lies in the field of psychology.

The definition of the word *profit* is not so simple. It has various definitions and the word is variously used. Many use the word as meaning the "gain resulting to the owner of capital from its employment in any undertaking" but that definition is too broad. It includes not merely the gain or profit from the use of capital but also the return for the use of capital.

The word *profit* has a much narrower definition and it means only the gain or profit from the use of capital over and above the return derived from the use of capital. The return for the use of capital I would call *interest*.

Interest is the proper word for the money paid by an enterpriser (entrepreneur in the language of the economist) for the use of borrowed capital. To an economist, the money retained by the enterpriser or paid by a corporation as dividends to preferred and common stockholders is also primarily interest. In a corporate enterprise profit it is only that relatively small amount obtained by common stockholders over and above the prevailing cost of equity capital.

The fact of the matter is that there is not much profit in any business undertaking, but there is or may be some, and that profit is what enterprisers strive with might and main to obtain and so it is said they are actuated or stimulated by the "profit motive."

Even when there is some profit in a business enterprise, it is not long enjoyed. Competitors see the successful operation of a profitable business. They copy the successful enterprise or method and their competition brings down prices and thereby profit sooner or later is eliminated.

This process is repeated and repeated, again and again. Some capable enterpriser, usually by trial and error, discovers how to make a profit. For a time he enjoys his profit. Other enterprisers almost as capable copy what the successful enterpriser has done and, if there is no monopoly to interfere with competition, shortly the successful enterpriser finds he no longer is enjoying a profit. Then again he does his utmost to get into a profit-making position.

This in brief and simplified form shows how the profit motive stimulates enterprisers into action which results in progress and benefit to the body politic and brings about greater productivity and so a higher standard of living.

The profit motive can well be visualized as the painted hare which mechanically goes around the dog race track with the hounds chasing the painted hare but never quite reaching it. Without the painted hare the hounds would not run.

So it is in business. The successful enterpriser seeks profit and temporarily catches the painted hare. Others follow and sooner or later also catch the painted hare and the painted hare ceases to be, until there is another painted hare and a new race.

You may have noted the greatly increased research activities of numerous corporations. Research as conducted by the universities is usually for pure science for the increase of knowledge. Research conducted by business enterprises is primarily for the development of new products from which profit may be derived, for

it is new products which sell at more than cost and for a time yield profit to the enterpriser.

The motives which impel people to industrial activity are manifold. The basic motive, of course, is that of realizing an income to provide the necessities of life for oneself and his family and so Arthur Brisbane, the renowned editorial writer of years ago for the Hearst newspapers, was correct in saying that necessity was the spur to productive activity. Today with the existing elaborate system of public assistance, the bare necessities of life are within the reach of everybody. People generally are not satisfied with the bare necessities of life but want in addition thereto comfort, security and even the means for extravagance. There can be no doubt but what for exceptional activity some kind of a reward is necessary to provide an adequate motive.

Napoleon Bonaparte invented the small red ribbon for exceptional men to wear in the lapel of their coat as members of the Legion of Honor. The striving for membership in the Legion of Honor and the right to wear the small ribbon in his lapel provided a very efficient motive for many people of exceptional ability.

The importance of motive in this world is also made apparent by a reading of Toynbee's Historical Works, or at least an abridgement thereof. You will see therefrom that the permanency of civilization itself is dependent upon struggle or striving by humankind for Toynbee teaches that, if such struggle or striving declines or disappears, civilization itself declines and in some cases even disappears.

This may be sufficient to tell you how important the profit motive is in our industrial life, but to go even further and say that without the profit motive our free enterprise system could not possibly exist and certainly it would not result in high productivity and a high standard of living and who does not want a high standard of living.

No matter how profound and acceptable we think the socialistic slogans, such as "necessities for all before luxuries for any", "distribution according to need and not according to right", "profits for all and not for a few", etc., the fact is that with human nature as it is these slogans do not serve as adequate motives for productive action. Most people are selfish and only a few are altruistic.

When tried on a small scale socialism is doomed to failure. When tried on a national scale, as was done in Russia following World War I, socialism and its euphonious slogans proved to be unsuccessful and inadequate. All you need to remember is that under free socialism in Russia production declined by 50 per cent from what it was at the time of the Czars, when the Lord knows the standard of living in Russia was low enough for the masses of the people, and the situation in Russia became so intolerable that Lenin and his successors had to resort to compulsory labor, a form of human slavery, to which they have given euphonious names such as the "Five Year Plan", the "Second Five Year Plan" etc.

Let us now turn attention to present day conditions in the United States.

It is hoped that all agree:

1. That a high standard of living is desirable if we do not permit ease and luxury to weaken our physical, mental and moral vigor and if to that end we conscientiously practice the virtue of self-denial;
2. That productivity determines our standard of living and that the standard of living in the United States of America is high because of our great per capita productivity;
3. That our productive capacity is as great as it is because:
   a. We have been blessed by the Almighty with great natural resources, mineral wealth, fertile land, excellent rivers and harbors and such things including a vigorous climate;
   b. We have a healthy, virile, hard-working intelligent population; and
   c. We have a large supply of capital goods created in the only way in which capital goods can be created, mainly self-denial, saving and investment; and
   d. We have our proven productive free enterprise system, dependent as it is on the profit motive, which gives the stimulus for the striving of ambitious men and women.

We now have more or less labor union domination insisting upon higher and higher wages and so-called "fringe benefits". The excessive labor costs brought about by this monopoly force must be met by higher prices for products, even though higher prices to consumers thereby result, which erroneously has been called inflation.

The author is not in favor of inflation but to be fair it must be said that inflation probably results primarily, if not solely, from government spending and monetary policies and credit expansion, although labor union policy with its present day monopoly power plays a considerable part nowadays.

The evils of inflation are very great indeed. Inflation decreases the value of insurance, of savings account and of securities which have a fixed rate of return and so inflation is especially hard on women and children and the aged, who are dependent upon investment income, other than common stock dividends.

Perhaps the greatest evil of inflation is that it disturbs all business relationships for it is difficult indeed to readjust business relationships repeatedly as inflation occurs. Of course, if inflation is carried too far, an absolutely ruinous situation develops, as it did in Germany following World War I, when the German government probably consciously resorted to inflation and prices rose to fantastic levels and a large part of the population was ruined.

Notwithstanding the evils of inflation it should be pointed out that no democracy can live with deflation, for when deflation occurs business is always bad and serious unemployment develops. As you know, when some relatively small measure of unemployment developed in 1957, we quite hurriedly resorted to inflation to stop the so-called recession and so today we have an inflation situation which must be faced.

The ideal, of course, is to have neither inflation nor deflation.

An impossible situation is created if, with inflation occurring, or wages increasing as a result of labor union

demands, industry by governmental control or otherwise is prevented from passing on to the consumer the higher prices for products occasioned by increasing costs of production. So doing would, of course, prevent the obtaining of a fair return for the use of capital employed by the industry and obviously would make the obtaining of profit impossible and so absolutely destroy the profit motive in productive industry.

There are those in public life who today think they are rendering a public service when they expressly or impliedly threaten to use the power of government to prevent producers from passing on to consumers the advancing costs of production. The evil of their course is not generally perceived by the public and therefore it is quite important today that we give consideration to the place in our economy of the profit motive and defend the same as the author is doing, for otherwise our free enterprise system would come to an end and there would be nothing left except governmental control and operation, and who is there, either in government or out of government, who is wise enough to control the economy of a great and complex nation such as the United States of America.

All would be fine if people were unselfish and if every man acted as if he were his brother's keeper, but unfortunately that is not the way we were made. We are selfish and usually we are not even actuated by what the economists call "enlightened self interest."

It takes necessity to make us work and the desire for more, or the profit motive, to do our best. This simply is the rule of life, whether we like it or not, and so anything which eliminates profit and destroys or weakens the force of the profit motive is unfortunate.

Compulsory labor, or human slavery, may be more productive than people under the utopia of a socialistic economy, but never as productive as a free people in a free enterprise system actuated by the profit motive even though profit, without monopoly, is hard to obtain and impossible to retain.

It is worthwhile to remember that without monopoly profit is never a large share of what is produced and so the profit motive which so greatly increases productivity is not burdensome on society.

It is only because some persons in high places have forgotten these elementary propositions which have been so briefly set before you that the author consented to submit this defense of the profit motive.

For completeness a word should be said about the speculator and his so-called "profit" which we know today as long term or short term capital gain under the Income Tax Law. A "speculator" as I understand the term, is, generally speaking, not a productive person, for to me a speculator is a man who buys something at a low price and sells it at a higher price, thereby realizing a so-called profit or capital gain. The speculator merely buys cheap from the unwary and sells for a high price to those not so farsighted or lucky as himself. He is not productive and while at times he may perform the function of assisting in the establishment of prices to bring about an equation of supply and demand, that function by speculators is of but slight advantage in the productive picture.

Unfortunately, under the Income Tax Law, capital gain with its limited taxation may be the only method today of accumulating a fortune, but that is only because of the inequity of our tax system. Instead of favoring the speculator the writer would favor the productive member of society and the only justification for the capital gain provisions of the Income Tax Law is the avoidance of a greater evil of inflation by taxing the increase in prices resulting from inflation itself.

Water works people realize that profit has been eliminated in the utility industry because the regulatory commissions see to it that operating revenues derived by a utility tariff are limited to cost, both cost of operation which is known as operating expenses and cost of capital which is the allowable return on the capital employed in the industry. Thereby the profit motive has been eliminated in the regulated utility industry.

However, the profit motive has been ingrained in business men probably from time immemorial and certainly since the Industrial Revolution. The profit motive is the motive which has stimulated productive conduct and don't think that the men in the utility industry have not sought after profit.

Their endeavor, of course, is first to insure, if possible, a fair return for the use of capital employed by them, but the unusually efficient operator seeks more and is entitled to more.

While seeking to obtain a fair return on the capital employed in the utility industry, the financial or economic experts who have testified as to fair return or the cost of capital or money have always endeavored to secure something additional, usually very little, for the efficient operator over and above the bare cost of capital.

The regulatory commissions seem to appreciate that this is proper because everybody knows the evils of the so-called "cost-plus" payment for contract performance. If an operator is assured by the government or his contracting party of the payment of all his costs including overhead, and, as some say, profit, but which usually is only plant rental or interest, costs mount and payments increase and it is immaterial whether the operator is efficient or not. This method of compensation is simply not good sense and the regulatory commissions to some extent seem to appreciate this.

Unfortunately in Pennsylvania, the Pennsylvania Public Utility Commission has endeavored in some cases to allow as a return for the use of capital employed not only the bare cost of the capital employed, as determined by the Commission, but something additional for one stated reason or another, but usually never for the stated reason that the Commission wants to reward efficient operation, which, of course, is difficult to measure and so not usually stated.

The chief reason why efficiency in operation is difficult to measure in the water works industry is because each water works plant is *sui generis*, that is to say, of its own kind. It is quite difficult to compare the management efficiency of two water companies. Nevertheless some method must be developed for estimating the operating efficiency of the management of a utility whose rates are under inquiry and the regulatory commission should grant some reward by its rate of return allowance for superior operating efficiency, where the same is provable and has been established.

The Pennsylvania Public Utility

Commission in some cases has fixed the allowable rate of return at slightly more than the bare cost of money. Originally in the Manufacturers Light and Heat Case, 178 Pa. Superior Ct. 46, it added 0.19 per cent to the bare cost of money for, as it said, the "normal risks and uncertainties associated with financing in the capital markets." The Commision was reversed by the Superior Court in this case partly because of its rate of return allowance and the case was remanded to the Commission. The Commission again added 0.19 per cent to the allowable rate of return as its judgment allowance "to provide a slight margin for adverse fluctuations in the general market and for deviations from recent typical market conditions that might be experienced by respondent in actually obtaining capital."

Again the Superior Court (182 Pa. Superior Ct. 376) reversed the Commission holding again that the allowance of an additional 0.19 per cent to the allowable rate of return was for matters which had been considered in determining the cost of capital.

Fortunately, the Pennsylvania Superior Court has remained fixed on the proposition that the allowable rate of return is not always synonymous with the cost of capital. This is sound and advantage thereof should be taken. Economists and financial experts should devote their attention to the introduction of competent evidence as to the efficiency in operation of the utility whose rates are being investigated as support for the allowance in the rate of return of some reasonable percentage or amount for such efficiency in addition to the bare cost of capital.

There should be a reward for efficiency in order to avoid the evils of cost plus. There must be found some sound method which the Commission and the Superior Court will sustain, which will justify the Commission in allowing an efficiently operated utility a return more than the mere cost of capital.

It is supposed that mere average efficiency will not be sufficient because operating efficiency is to be presumed. The holding companies are now in many instances required to show the cost of money to them instead of to the subsidiary utilities being operated by them. The expense of management under a holding company may be substantially less than the cost of management to an independent company. There undoubtedly are efficiencies resulting from holding company management and while the courts cannot be expected to support in operating expenses an allowance for such efficient management, it would seem proper that there should be some allowance for unusually efficient operation, particularly when the consumers get the benefit of the low administrative cost and the lower cost of capital resulting from holding company operation.

There is of course some danger or risk in what the author is suggesting. If the efficient are to be rewarded, the inefficient might be penalized but such is also the rule of life.

For call it foolish whim of life
or iron rule of fate
Small things are destined for the small and great things for the great.

Financing and Earnings of Water Companies

by FERGUS J. MC DIARMID, Vice Pres.
Lincoln National Life Insurance Co.

■ THE RECORD, over the last 58 years, of operating public utility bonds (other than those of street railways) in paying the promised number of dollars on time has been close to perfect. While one might have suspected something of this sort, it was made a matter of established record by a recently published study entitled, "Corporate Bond Quality and Investor Experiences." This study, which was prepared under the suspices of the National Bureau of Economic Research, covered a total of nearly 7,500 individual bond issues totaling $56 billion which were sold over the years from 1900 to 1943. They included $24 billion of public utility bonds, which was not much short of the total amount of utility bonds outstanding at this time. While this study ended with the year 1943, the experience since that time has done nothing to disturb the conclusion which can be drawn from it, at least insofar as public utility bonds are concerned. The real testing period was prior to 1943.

Compared with corporate bonds in general, the showing of public utility bonds has been spectacularly good. The record shows that for public utility bonds which had 2 times coverage of interest by earnings or better at time of issue, and excluding street railway issues, there were no defaults whatsoever. Even when this coverage went as low as 1.5 times at time of issue, the default rate was negligible. Small utility bond issues had about as good a record as large utility issues. This record was very much better than for industrial bonds as a class. It enables one to say that the bonds of operating utilities, other than street railways, during the first year of the century leave nothing to be desired insofar as the contractual payment of dollars is concerned.

Some significant conclusions may be drawn from this study:

1. Any risk in public utility bonds

has been an industry-wide risk rather than a risk applying to individual companies. In the case of water companies this risk must be considered extremely small.

2. This practically perfect record of operating public utility bonds as a class, other than street railways, tends to make the rating of these bonds on a quality basis appear to be a rather silly business, a form of statistical leaf-raking you might say.

This very favorable record of public utility bonds does not necessarily

indicate that such bonds are a satisfactory medium for preserving the real values created by savings. It simply indicates that the promised number of dollars will probably be paid on time in the future. The great element of risk which has to do with the declining value of the dollar remains, and this risk factor totally overshadows and renders insignificant the risk of failure to pay dollars as promised.

Present and future

In any former generation during the last 125 years, which is about the lifespan of corporation finance in this country, this practically default-proof record of the bonds of operating utilities, including those of water companies, would have classed them as a most excellent medium for the preservation of the real values derived from the savings process. This, unfortunately, is not true today, for these bonds are no better than the dollars in which they are payable, just as a chain is no stronger than its weakest link. The so-called gilt-edged bond, which in generations past has represented all that was safe and sure as a medium for preserving savings, no longer occupies that position in the minds of investors today who have freedom of choice.

What is going on in the minds of such people is pretty clearly indicated by certain trends in the financial markets during the last year, and particularly during the last few months. In spite of a rather sharp decline in business activity and in corporation profits, the stock market has shown remarkable staying power and strength. The Dow-Jones Industrial Averages are again approaching an all-time high. Common stocks are selling at very high historic levels in relation to earnings.

The bond market, on the other hand, and this includes the market for preferred stocks, has been sluggish at best and chaotic at worst. Interest rates on bonds are again approaching the levels of mid-1957. At the present time financial institutions which are prepared to exercise a little ingenuity have no difficulty in obtaining a materially higher yield on well-secured bonds than the dividend return currently payable on a cross section of common stocks. This includes public utility stocks.

It is easy to speculate on the reason for this state of affairs. Due to past inflation and the fear of additional inflation, bonds have become unpopular but common stocks are popular with a great many investors. They reason that even a 5 per cent return on a taxable bond provides little real return to an investor. First of all, some part of this interest, which is probably between 2 and 3 per cent, must be regarded not as interest at all, but as an offset to loss in value of principal through inflation. Much or all of the rest will be paid in taxes, leaving little, if any, net return on the investment.

Partly as a result of this situation, the market for corporate bonds, and for preferred stocks as well, now lies largely with financial institutions such as life insurance companies and pension funds. Because of the nature of their liabilities and the laws under which they operate, such institutions, up to present at least, must invest largely in fixed dollar securities. This market, therefore, is in the nature of a captive market. There is reason to believe that the size of this market is not growing and may even have started to decline in over-all size.

In the years leading up to 1950 life insurance companies were the most important market for public utility bonds, including those of water companies, and these life insurance companies still own nearly half of the total outstanding bonded debt of the public utility industry. However, since 1950 they have been buying public utility bonds on a declining scale and have tended more toward industrial bonds and mortgages. One of the reasons for this might be that they are tending to shy away from long-term bonds, say with a maturity of 30 years, and with little or no amortization in the meantime. Also, they have become very conscious of the need for call protection, which is frequently held to a minimum in the case of utility bonds.

As previously stated, public utilities, including the water companies, must sell their bonds today almost entirely in the captive market represented by financial institutions. Due to the very heavy borrowing demand which we have experienced in recent years, and will no doubt continue to experience, this captive market is able to become increasingly selective. The question arises, therefore, what can the water companies do to make their bonds and preferred stocks more attractive in this market.

First of all, it is suggested that a 30 year bond with no amortization during its life is a very unappetising-looking spectacle in an era where money continues to lose value. It would be made much more attractive if a sinking fund, operating at the rate of at least 2 per cent or more a year, were inserted in the bond. This would cut the average period to maturity of the issue. Also, it would provide price support for the bonds and give the holders a chance to get out on some kind of a reasonable basis if they wanted out.

The public utility industry in general, and the water industry in particular, is a growing one with a continuing demand for capital. The idea of paying off debt may seem inappropriate. However, what has been suggested would merely mean that financing would have to be done more often than otherwise. The Lincoln National Life Insurance Co. recently turned down a 5 per cent bond issue of a very good water company, and the main consideration in this turndown was that the bond had no provision for amortization. Just as good a rate on bonds of much shorter maturity and with provision for amortization besides can be obtained.

Quite a number of water companies have been selling preferred stock issues containing sinking funds of 2 per cent or better, and a number of such issues have been bought. What is really wrong with doing the same for bonds?

Call Protection

Another point is call protection. When a buyer has the hardihood to buy long-term bonds in the present age of inflation, he wants the assurance that he will be allowed to hold these bonds at the contractual interest rate for at least a reasonable part of their life. He does not want to be subject to the "tails you lose, heads I win" proposition, that anytime interest rates sag a little he will have his investment taken away from him. Most institutions have suffered a great deal from such calls in the past. It is extremely difficult to appreciate the reasoning of regulatory authorities who try to deny investors this rather obvious type of protection.

Fallacies and Facts

FALLACY	FACT
The earnings of a water company are very stable so that it should be able to get along with a lower rate of return than other public utilities.	In an inflationary period such as we have been going through, and which still persists, this simply isn't true unless frequent and substantial rate increases take place. There is practically no element of buoyancy in water revenue such as to be found in electric and gas revenue. On the other hand there has been a steady upward trend in the expense and taxes paid by water companies. As a result, the net earnings of water companies tend to operate on a kind of ratchet system. They are squeezed downward until raised by a rate increase and then the squeeze begins all over again. The average rate of earnings tends to be considerably lower than that achieved immediately following a rate increase. This tends to form an up and down pattern of earnings somewhat like the teeth of a saw, and there is nothing very stable about a buzzsaw.
Water companies are able to finance at lower cost than other utilities so that they should be able to get along with a lower rate of return.	It just isn't so. First consider the matter of senior financing in bonds and preferred stocks. Water companies tend to be medium and small-sized utilities. Their average capitalization is much less than that of the typical electric utility. Their bond issues tend to be of rather small size and because of this, in order to save costs, are frequently sold privately. This type of financing usually involves somewhat higher interest rates and more restrictions than are to be found in large bond issues sold at competitive bidding. The Lincoln Life Insurance Co. bought a large number of water bond issues and that is one of the reasons for it. What has been said about water company bond issues is also generally true of their preferred stock issue. Therefore, the cost of senior money to a water company tends to be measurably higher than the cost of such capital to a major electric or telephone company.
Water is a natural commodity and a necessity of life. It flows in streams and falls from the clouds and, therefore, should be free or nearly so. Increases in water rates tend to work unfair hardships on small consumers.	Water as delivered to the customer by a water company is in the nature of a manufactured product. While water is certainly a necessity of life. it is no more so in this age than electricity and gas. It might also be claimed that electricity is a natural phenomenon since it exists in the clouds and in the universe around us. Electric and gas bills tend in general to be larger than water bills. However, this feeling about the water business that it should be run as a kind of semi-charitable institution seems to die hard.

Long Term Trend

What is the probable long-term trend of financing costs for water companies? Anyone who sticks his neck out on this subject must have a certain amount of hardihood, but I have developed certain opinions on the subject.

These opinions arise partly from the growing unpopularity of bonds as a medium for investment. In an inflationary age, bonds only make sense when the interest rate is high enough to effect the decline in value of the principal and to pay taxes. Having in mind this fact, which is merely a matter of simple arithemetic, it would be expected that the long-term trend of interest rates will be upward—this applies to the cost of preferred stock money as well. This opinion is based largely on a weighing of supply and demand factors in the market.

Impact of inflation

The impact of inflation on the operations and earning power of companies is very direct and severe, much more so, than on certain other types of utility operations. This is a very important fact which probably has not yet received from regulatory bodies the attention which it deserves. It is a fact which the author tried to drive home while testifying this year in a rate case on behalf of the Indianapolis Water Company. This approach may be of some interest.

Testimony for rate increase

Here was a situation where it was possible to make a direct comparison between a water company and an electric company serving generally the same territory. The electric company, of course, was Indianapolis Power & Light. The comparison was made for a 10 year period from the end of 1947 to the end of 1957. This was a period in which our dollar was losing value at an average rate of about 3⅓ per cent a year compounded. I might comment in passing that this annual loss in value was higher than the average rate which the water company was paying on its bonds over this period, so that these bonds were returning their holders a negative rate of return, not even allowing for taxes. This was a very sad state of affairs.

Over the 10 years the water company's customers increased 39 per cent of the electric company 39 per cent. So there was little difference here. The net plant account of the water company increased 114 per cent and that of the electric company 174 per cent. This indicates that the plant account of the electric company per customer served was increasing about half again more rapidly than that of the water company.

These comparisons are interesting, but they do not go to the heart of the matter. The really vital thing was that over this 10 year period the total amount of water sold by the water company increased only 28 per cent, but the power sold by the electric company increased 146 per cent. The power sold did a pretty good job of keeping pace with the increase in plant account. The power sold per customer increased 79 per cent and for residential customers only, the increase was 130 per cent. On the other hand, in the case of the water company the sales of water per customer were actually lower in 1957 than in 1947. This was true for all customers and for residential customers separately. Evidently the people of Indianapolis are getting steadily dirtier.

These statistical comparisons are vital in pointing out the very great differences in the impact of inflation on these two types of utilities. In the case of the electric company the very rapid increase in the amount of products sold, both in total and per customer, went a long way to offset the higher costs of materials and labor. Another important helping factor was the increase in efficiency in generat-

ing power which the water company could not hope to parallel.

The net plant account of the power company per thousand kwh. sold, increased only 10 per cent in the 10 years, or at the rate of only 1 per cent a year. However, in the case of the water company the net plant account per million gallons sold increased 67 per cent, or at the rate of 6⅔ per cent a year. To offset this rapid increase in plant in relation to the amount of water sold, the water company could expect to benefit only slightly from increased efficiency. However, in the case of the electric company a good rate of return was maintained with very little resort to rate increases, while the water company had to obtain substantial rate increases at fairly frequent intervals in order to maintain even a modest return on its plant investment.

At the end of 1947 the net plant account of the Indianapolis Water Company was $262 per customer. However, for each additional customer added in the next 10 years the net plant account increased $756, or by an amount nearly 3 times as much as the per customer plant account at the beginning of the period. People in the water business know that this was not because it took 3 times as much physical plant, that is, 3 times as many mains, services, meters, pumps, and purification equipment, to serve each of these additional customers as it did to serve the old customers. The additional physical equipment per customer probably did not increase much at all. The amount of water used per customer actually declined. It was simply that due to inflation the total cost of additional equipment went up. The dollar was the variable, not the amount of additional equipment per customer. The only way a water company has of offsetting the shrinking dollar is to collect more of them from each customer for a given amount of water delivered. In the case of a water company, increasing efficiency and higher use per customer are usually entirely insufficient to do the job or any substantial part of the job.

This was the approach to the Public Service Commission of Indiana in this case. How effective it was is not known, so the author certainly cannot take more than part of the credit for the results of the case. They asked for a 19 per cent increase in rates and got 17.5 per cent. Also they received it with a minimum of delay.

Water stock

It may come as a surprise that the stocks of water companies are not usually regarded as crown jewels in the common stock field. There are a number of reasons for this. First of all, the irregular pattern of earnings with a tendency to sag works against them. There is no natural growth factor in such earnings. There is a need for recurring substantial rate increases and the accompanying risk that rate increases granted will not be adequate and will only come after long delays. Delays in obtaining such increases are paid for directly out of the pocket of the stockholder. For these reasons it has been the author's experience that water stocks tend to sell at lower prices in relation to earnings and book value than do the stocks of other types of utilities. For instance, one large water company in the East is selling below its book value, a most unusual thing in the public utility field today. It is located in a state where the public service commission seems to feel that the proper rate of return to allow a water company is the rate the government pays on treasury bills.

It is, therefore, a definite opinion, which can be proved statistically, that the cost of capital to many water companies is materially higher than that of other types of utilities which operate in their territory.

It is amazing, however, to note that the rates of return allowed by public services commissions to water companies have tended to be lower than those allowed to the electric companies of the area. There is no basis whatsoever, with respect to the cost of capital, for such a state of affairs.

Conclusion

Can it be said then that the securities of water companies under present conditions are a good medium for the preservation of the real values represented by savings, and real values do not mean a fixed number of depreciated dollars. Bonds and preferred stocks have been discussed. These can only be considered satisfactory if the interest or dividend rate is sufficient to offset inflation, pay taxes thereon, and leave some net return besides. Over the last 18 years this, in general, has not been true of the senior securities of water companies.

With respect to their common stocks, these can only be considered satisfactory if the rate of return in dollars rises to offset inflation and to bring about an increasing market value for these stocks. At the present time most stock buyers are more interested in capital appreciation than in current income. Such appreciation will be hard to bring about in jurisdictions which cling to original cost valuation as the only basis for rate making. In such circumstances water company stocks can hardly hope to compete with other stocks in the eyes of intelligent investors. If all one has to look forward to in a stock is a rather fixed rate of dollar return, then that stock tends to take on the characteristics of a junior preferred stock. If all that a water company can offer its stockholders is a modest and somewhat erratic return on an original cost rate base, then probably the best thing for its stockholders is for the company to try to sell its property to a municipality. In such case, reproduction cost would have to be recognized.

The water companies have a good case for fair and reasonable treatment, just as good a case as any other type of public utility. It is up to them to present this case energetically and without delay.

Financial Statements

by DAVID DUNLAP, Secretary
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■ A NON-FICTION BOOK often inserts a preface in which the author tells the reader something of the way in which the main body of the book was prepared. This paper therefore deserves a preface since it represents the opinions and discoveries from the author's voyage into his own mind—a mind which for the first time in over thirty years of dealings using financial data has paused to spell out the basic ideas surrounding financial statements. No matter how non-fictitious this may be, it must be remembered that all places and persons herein named are.

Preface

At whom to direct this discussion? Should this paper be written to those of you who are already experts; or for those who have a nodding acquaintance with the subject; or for those who have none?

The expert is out because I'm not in his league. The middle man is out because he already has some grasp of the subject and may easily apply it to usefulness without my help. This leaves the man who knows nothing about them—the man to whom a discussion of financial statements might be of the greatest value.

My decision to write for this man has created a new dilemma. If I go into detail—if I say, multiply this by that, divide this into that, item by item, the reader will soon become bored and lose the thread of thought. On the other hand, If I speak only in generalities, he will get no practical benefit from the paper. I decided that the intelligent reader would benefit most if the fundamentals—not the techniques, but the basic ideas were stated in everyday language. For example, just why and what is a financial statement?

Three Types

There are three kinds of financial statements that are useful to the utility manager. They correspond to the past, the present, and the future.

The income statement is the story of the company's performance in the past; the balance sheet is a description of the company's status today; and the budget is an estimate of the course the company will take in the future.

Just as in human history the past, the present and the future form a continuous chain, so also in the financial history of a company the income statement of yesterday leads into the balance sheet of today, which in turn leads into the budget of tomorrow.

Because of the close relationship among the three statements, the basic ideas for all of them are the same. Consequently, further discussion of the balance sheet and the budget is not necessary except to demonstrate those basic ideas as they affect the income statement.

Income Statement

The demonstration will be in three parts. First, a look to see how an income statement is put together; second, why an income statement is put together; and finally, the way an income statement can be put to practical use by the water works manager.

First, how is an income statement put together? This might be easier to explain by using personal experiences. Every month or two the mailman brings a bundle of cancelled checks from the bank, arranged in the same order in which the bank received them. Most people rearrange these checks in the order of the dates issued, and match them against the stubs in the checkbook. This rearranging might be referred to as classifying the checks according to time, so they are in chronological order.

If a record of personal expenditures is kept as some people do, a second step in classifying cancelled checks might be taken. This would be to sort them out so that all the checks for household expenses are on one pile, all the checks for taxes are on another pile, and so on—insurance, rent, utility bills and all the other things for which money was spent. If this is done, it would be classifying the checks according to purpose.

As a final step, the checks on each

pile would be added together so that the total number of dollars spent for each purpose would be known.

To recapitulate: Step 1—Arrange the checks in chronological order, Step 2—Sort the checks into separate piles according to their purpose, and Step 3—Total up the amount of money represented in each pile.

This is all very simple and if understood the basic ideas of bookkeeping are understood. Everything the bookkeeper does is merely an elaboration of one or another of those three steps. Every financial transaction of the company is recorded in chronological sequence, in a book called the journal. Then the bookkeeper classifies the transaction according to its purpose, in the same way that a person looks at a check paid to the grocer and puts it on the pile for household expenses. This is called "posting to the ledger".

Finally, at the end of every month or some other interval, all the transactions for each purpose are added up; the purposes and the totals are listed on a page in logical groupings such as putting all the distribution expenses in one place; and this is finished off by putting at the top of the page a heading which reads "Income Statement for the Month of March, 1959".

Now all of this may seem very elementary but for the sake of the next point, let us run through the thought processes of the last few minutes. It started with a bundle of checks or a series of business transactions—let's call them the raw materials. They were sorted out, like

materials put together, and the result was an income statement. Let's call that income statement the end product.

What does it say

Now, here is the next point. Most people, confronted with the raw materials, can see how they are built up into the end product; but there are a surprising number of people who look at an end product without visualizing the materials from which it has been made. The psychologists would say they do a lot better on synthesis than on analysis. The auto mechanic might say that their mental machinery lacks a reverse gear.

Basically, the reason for this failure to reverse the mental processes is the habit of regarding imaginary things as if they are real. This can be illustrated by analogy.

People speak of the Pennsylvania Water Works Association as if it were something separate and distinct from themselves. But to pause and think for a moment, they realize that the Association has existence only in their minds. The name of the Association is merely a convenient way of referring to a particular group of separate persons.

In the same way, the accountant has developed a number of convenient terms, each one of which refers to a particular group of separate transactions. Take the very first line of a water company's income statement, for example. It says, "Operating revenues, $100,000". What it really means is, "The Smith family used $30 worth of water at their house last year. The Brown family bought $40 worth. By adding up the dollars for all the water taken by the Smiths and the Browns and the other families served, the total $100,000".

Or consider the line on the income statement that says, "Distribution maintenance labor, $4,000". This is just the accountant's way of referring to the time Charlie Dobbs was sent out to paint the fire hydrants, and that other time when the gang thawed out the line at Sixth and Main Street.

Make it a habit, when looking at an income statement, to think of the Smith family, or of Charlie Dobbs painting the fire hydrants. In looking at each line of the statement, try to picture just one everyday example of the kind of happening that lies hidden in the formal accounting term. By doing this, two rewards will be gained. First, an income statement will no longer be a bunch of figures. Second, an insight will be gained into the first and biggest step in putting financial statements to practical use.

What does it mean

A financial statement classifies and arranges thousands of separate facts into a few simple ideas that can be readily grasped by the human mind. The financial statement lets you see the forest instead of the trees. It provides an overall picture which would not be possible by thinking only in terms of the Smith family and Charlie Dobbs.

Not only does the financial statement reduce thousands of facts to a few ideas. It also expresses those few ideas in terms of the same units. When they are expressed in the same units, they can be moved around in different patterns to get new and useful ideas from them. As the name "financial statement" implies, all the information on it is expressed in terms of money.

Think along for a moment about the ways in which money is used. For one thing, it is used as a medium of exchange. A company exchanges water for money, and then exchanges the money for pipe or postage stamps. Money is also used to store value, pretty much in the same way meat is stored in a freezer. It may wait a month or a year or ten years in a bank before it is consumed by drawing a check to be given in exchange for something else.

But money also has a third use, as a unit of measurement, like the yard or the pound. It is impossible to add two apples and three pears to get five of anything. But it is perfectly valid to add the weight of two apples and the weight of three pears, for in that case pounds are added to pounds. The apples and the pears have been reduced to the same units of measurement.

In the same way, 1,000 feet of pipe and one reservoir cannot be added to obtain 1,001 of anything. But $50,000 of pipe and $80,000 of reservoir can be added and $30,000 of depreciation subtracted from the total. The result can be divided into the net utility income to see how much return is obtained on the plant investment.

Just for the sake of emphasizing this point, return to the Smith family and Charlie Dobbs. It is impossible to divide Charlie by the Smith family, or the number of fire hydrants Charlie painted by the gallons of water the Smith family used, and expect to get any useful result. But it certainly is possible to divide $4,000 of distribution maintenance expense by $100,000 of revenues, to get 4 per cent. An explanation of the 4 per cent will come later.

Practical use

How can the water works manager put financial statements to practical use.

One practical use and the process behind it will be explained merely as a sample. Once the knack of the process is understood, it can be applied to many other situations.

Think of a financial statement as something like the report the doctor provides after a physical check-up. It will tell on what points your company is strong and healthy; and it will warn of the weak points that need attention.

Both kinds of knowledge are valuable. If the financial statement shows that some aspect of the company's affairs is flourishing, that should be the signal to continue the practices that brought about that happy condition. On the other hand, if the statement shows up a weak point, that should be the signal to look for the causes and make the necessary adjustments.

Perhaps the manager believes that he already knows the weak points of the company; but are all of them really known, or only those that have become serious enough to force themselves out for attention? Just as a physical check-up of the human body often discloses incipient trouble spots of which the patient was unaware, so also a financial statement, if properly used, can help locate the little illnesses of the company and stop them before they become big ones.

The process used for this purpose involves nothing more than common sense and some simple arithmetic. Consider common sense first, and think of it in terms of a physical check-up by the physician.

Suppose this is the first time you have ever gone to this particular doctor. He puts his stethoscope against your chest and listens to the beats of your heart. He looks up at you and says, "You have a pulse rate of 80 per minute. That's bad".

Table 1

	1956		1957		1958	
	$ Amount	%	$ Amount	%	$ Amount	%
Revenues	80,000	100	90,000	100	100,000	100
Dist. Maint. Exp.	1,600	2	2,700	3	4,000	4

Now, suppose instead that you have had this doctor give you a check-up every year for the last 20 years. Again he puts his stethoscope on you, but this time he says, "Your pulse rate is 80 per minute. That's *fine*".

Now notice that in both of these short stories, the doctor stated a pulse of 80, but in one case he said it's bad, and in the other case he said it's good. How can he reach such contradictory conclusions on the same facts? For that matter, how can he reach any conclusion?

Common sense says that something cannot be pronounced good or bad unless compared with some standard. In the first story, the doctor compared 80 heartbeats per minute with the normal 72 of most human beings.

In the second story, the doctor compared the present 80 beats per minute with a record of 81 last year, 82 the year before, and 83 the year before that.

The reason the doctor said "That's bad" in one case, and "That's fine" in another, is that he used different standards. When the doctor compared 80 against the normal 72 of other humans, he had a rough gauge; but he doesn't get a really reliable picture until he compares the present 80 with the past record.

Exactly the same principles apply in using financial statements. First, no figure on the company's financial statement, standing alone, is going to yield much useful information—it must be compared with something else to make it meaningful.

Second, the best standard for comparison is the company's past performance. Just as in one of the stories the doctor compared 80 with the normal 72 of other people, so it is possible to compare a company's financial statements with those of other companies—but this provides only a rough gauge. Why use a rough gauge when a fine one exists in the company's own records?

Here's how to use the gauge. Suppose that in the three years from 1956 to 1958 the revenues were $80,000, $90,000 and $100,000; and in the same years the distribution maintenance expenses were $1,600, $2,700 and $4,000. By dividing the expenses by the revenues a percentage is obtained as shown in Table 1.

The expense went up from 2% in 1956, to 3% in 1957, to 4% in 1958, or as shown the distribution maintenance expense is increasing faster than the revenues. This can be done by dividing both the 1957 and 1958 revenues by the 1956 revenues, and the same for expenses.

Another method for presentiing these figures so they reflect what expense is moving in relation to all other items is shown in Table 2.

No matter which way these percentages are computed they show that the distribution maintenance expense is going up faster than revenues.

However, it can't be concluded from this that something is surely wrong in the maintenance department. Maybe Charlie Dobbs painted the fire hydrants only once in 5 years, and 1958 was the year. Maybe the last couple of winters were cold enough to freeze more than the usual number of mains. On the other hand, Charlie may have gotten into the habit of sneaking into the local barroom for a quick one, and charging up the time against the job. Common sense says not to act on the figures without further information; but the figures themselves tell the manager that he ought to go after that further information as soon as possible.

Table 2

	1956		1957		1958	
	$ Amount	%	$ Amount	%	$ Amount	%
Revenues	80,000	100	90,000	113	100,000	125
Dist. Maint. Exp.	1,600	100	2,700	169	4,000	250

Business Side of Water Works Management

One of the four seminars during the annual meeting of the Penna. Water Works Assn., was devoted to the business side of water works management.

The initial discussion ranged over the problem of reports. What kind of financial reports should the accountant prepare for the water works manager? For large companies, these are generally voluminous and incorporate historical statistics, ratio analysis, as well as current data. Small organizations provide less complete information. Less information may be better if the subject matter is well organized.

At some water works there often is a tendency toward obsolescence of forms and some operators believe that forms in use are too complicated. Minimum forms utilized by one company included monthly operating statement, cumulative monthly report, former years data, cash flow, and aged account statement; general water works uses income statement, balance sheet, and a breakdown of expenses, as to payroll, materials, supplies, and others. One topic of lively interest concerned the charging of labor cost to capital or expense account, but there was no common viewpoint on the matter.

The problem of rate base and property valuation falls into the area of depreciation and funds for expansion. Property held for many years was depreciated on the books of one company, but total funds required for replacement or expansion were considerably in excess of such reserves. Economic depreciation, replacement cost, fair value, current cost and use of Bureau of Labor Statistics Indices to adjust property account may be considered from many standpoints including that of the regulatory commissions. Inflation and its effect upon rates, income, expenses and invested capital came in for a part of the discussion on rate bases and depreciation.

A suggestion was made that water companies issue bonds with serial maturities in order to provide holders with a means of revolving investments —significant in a time of rising interest rates. (F. Stone)

Thorough surveying of sewage and industrial wastes, ample testing and sampling procedures, and cooperation of industries concerned result in an economical . . .

Sewage Plant *designed to handle industrial wastes*

by ROBERT DYMENT
Technical Writer, Dunkirk, N.Y.

■ A NEW $280,000 SEWAGE UNIT completed and put into operation in 1957 in the Borough of North East, Pa. has ended a big pollution problem in the area. The design of this plant by the Consulting Engineering firm of Hill & Hill of North East is not a conventional sewage treatment plant because of the high industrial waste load that the plant receives.

The design was based on material gathered starting in 1949 and incorporates these findings into an economical plant that combines the best features of the old existing plant and the studies made over the last six years of methods to treat this type of industrial waste.

For the first time in many years, 16-mile creek, which runs through the Borough of North East on the west side, is now supporting fish life. Previously there had also been many complaints from the residents who live adjacent to this creek and the cottage owners near the lake because of the odors that came from the creek.

These odors were caused by the discharge of industrial wastes, mainly from the Welch Grape Juice Company and from the North East disposal plant.

Both the Welch Grape Juice Company and the North East Borough have had sewage treatment plants for many years; however, due to the large increase in production of fruit over the last 15 years, both of these plants were inadequate.

Sewerage was treated but both plants were undersized and the amount of treatment was not enough to prevent these odors and nuisances in the 16-mile creek.

The Welch Grape Juice Company completed their new industrial waste treatment plant about January 1, 1957 and on August 15th, the North East disposal plant had a final inspection by the Federal Authorities, State Authorities, the North East Borough Sewer Authority and the Engineers for the final acceptance of the completed new additions to the North East disposal plant.

These new additions to the North East Disposal plant were constructed by the Sewer Authority at a cost of $280,000. They consist of a new control building, a new filter, two additional settling tanks, pumps and the other necessary equipment.

In the new control building is also a complete laboratory for the analysis of the wastes and for the control of the treatment process. The laboratory is under the direction of Ford Scott, the new disposal plant operator and chemist.

In 1949 a complete and thorough survey of the industrial waste problem in the Borough of North East was made and submitted to the Borough Council. This showed that the plant was receiving wastes that were approximately 10 times as strong as the plant was designed to handle. These wastes were as strong as the wastes normally received from a community of 40,000 people.

Between 1949 and 1956 the Borough Council had been carrying on negotiations with the various industries contributing to this high industrial load in order to reach some agreement as to how the Borough would finance the additions to the disposal plant.

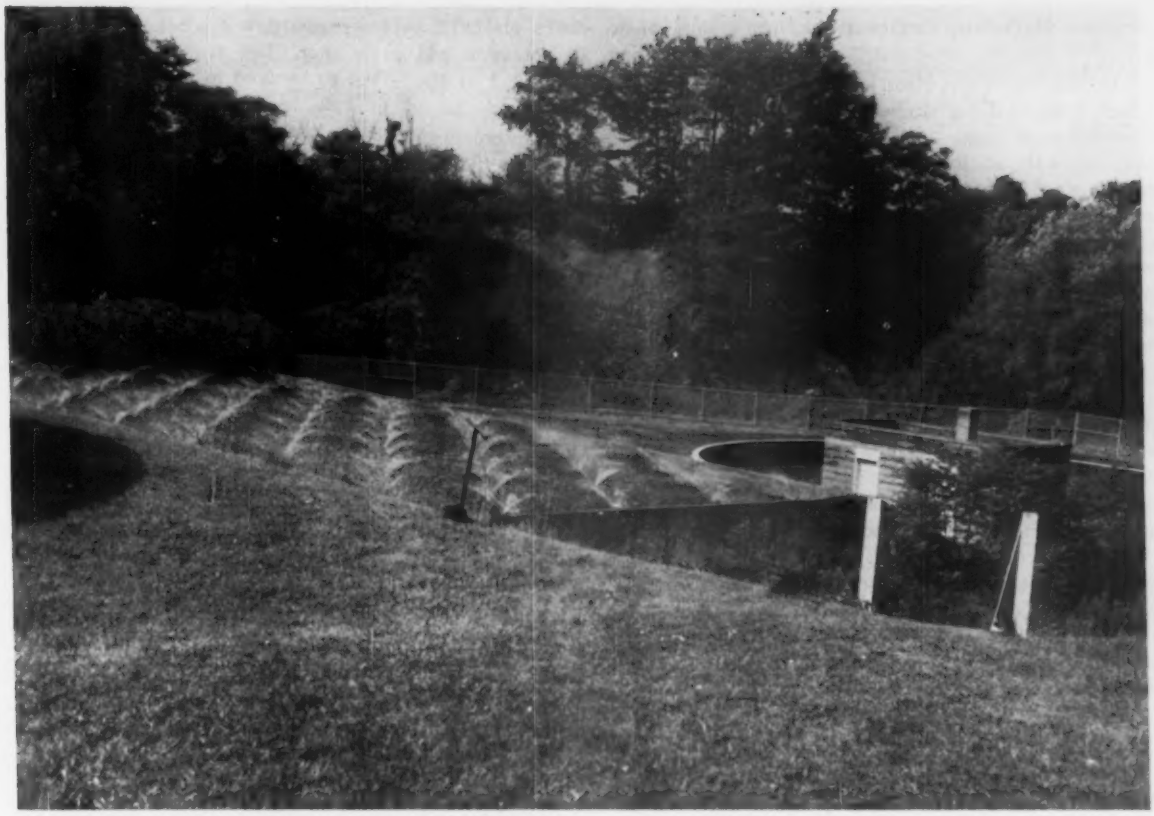
In 1955 an agreement was reached and the Council authorized their engineers, Hill & Hill, to proceed with the design and the construction of the disposal plant.

The work was completed, three months ahead of schedule, which allowed the Borough of North East to put the plant in operation in time to catch the industrial wastes from the cherry season and all the way through the tomato and grape season.

CONTROL LABORATORY INTERIOR. Ford Scott, chemist and plant operator discussing new equipment with John Hallenberg, Consulting Engineer.

Engineering Analysis

John K. Hallenburg, Sanitary Engineer with the Hill & Hill Consulting Engineering firm said,



OLD FILTER, one of the first in northwestern Pa. (1914), is now used in conjunction with the new trickling filter.

"The trickling filter plant in the Borough of North East has had a growing problem for many years. Located within the Borough of 5,000 people, are four fruit processing plants and one milk plant. All of these plants with the exception of the Welch Grape Juice Company discharge their industrial wastes into the borough sewer system and the wastes are treated with the domestic sewerage at the borough treatment plant.

"The plant, one of the first trickling filter plants in northwestern Pennsylvania was built in 1914 for a population of 2,500. By 1935 the population had increased to about 3,500 people, however the fruit processing plants were beginning to expand and the treatment plant had to be expanded to a population capacity of 6,000. No enlargement to the plant had been made from that time (1935) until the present construction program which was completed in 1957.

"Very shortly after the 1935 addition to the plant was completed, the fruit packing industries began a rapid expansion which more than tripled during the next 10 years. By 1948 the wastes during the processing season were seven times greater than the capacity of the disposal plant.

"In 1949 a complete and thorough survey was made of the entire system and it was discovered that during the fruit season the treatment plant, designed for 6,000 people, was receiving an average equivalent population load of approximately 40,000, with peaks as high as 66,000 based on BOD and an average flow of only 5500 equivalent population during fruit seasons. The fruit season begins about the first of July with the processing of cherries and reaches a peak around the last of September when both tomatoes and grapes are being processed and ends the first of November. The BOD during these seasons gets as high as 3,000 ppm and very seldom drops below 1,000 ppm."

The plant which consisted of primary settling tanks, a fixed nozzle standard rate filter, and an inadequate secondary settling tank (25 minute detention) was designed on the basis of 250 to 500 lbs per acre foot. It was treating approximately 3000 lbs per acre foot. After the filter first began to receive the heavy load, that is during the cherry season, it removed an average of 91 per cent of the BOD with periods as high as 98 per cent.

However as these extreme loads continued during the following season the amount of removal dropped. During the tomato season, it removed an average 85 per cent and during the grape season an average only 67 per cent. Drop in removal over 4 month periods were not affected by peak load but by extended period of overload.

After the palnts have finished pressing the grapes, they usually shut down completely for a two to four week period vacation and then start a bottling process concentrating on the manufacture of jams and jellies, etc. This short period seems to be all the filter needs to completely recover, as although the loads during the winter and spring are not as high as during the processing season, they still remain about 700 to 900 ppm of BOD and with this loading the filter returns to its high performance.

Engineer Hallenburg further stated that,

"Since the report was made in 1949 we have continued our studies of filter performance under these extreme loads, not only at the North East Borough plant but also at a pilot plant constructed at the Welch Grape Juice Company in North East which is not connected to the borough sewer system. This pilot plant consisted of settling tanks and 2 high rate filters that could be used either singly, in series, or in parallel. These filters were loaded up to 45 lbs of BOD per cu yd and hydraulic loadings ranging from standard rate to high rate filters.

"From our studies we have found that the filter, either high rate or standard rate, account for almost all of the BOD removal. This type of wastes contain only 10 to 15 per cent suspended solids so only a small percentage of the BOD is removed in the primary settling tanks.

"It was also noted that the only factor that materially affected the performance of these filters, was the pH of the wastes. If one of the larger fruit plants failed to lime their wastes for a short period because of a breakdown of their feeders, or if the operator neglected to fill the hoppers, as has happened, this low pH of 4.0 to 5.0 for a few hours would substantially reduce the amount of treatment for about 2 days. The fruit wastes naturally are acid and for this reason the Borough has required that the plants lime their wastes and as an added precaution, an automatic pH control system was installed at the borough plant.

"The standard rate filter, even though it was not receiving the hydraulic loadings of a high rate filter and was being dosed intermittently, was behaving as a high rate filter, that is; it continually discharged a light floc rather than a periodic sluffing of sludge."

A high rate filter gave its best performance on these wastes with loading between 2 to 4 lbs of BOD per cu yd and the second high rate filter in series did little to increase the BOD removal unless the loadings were below 2 lb per cu yd total for both filters. There appeared to be a sharp drop in removal between 5 and 6 lb per cu yd. This didn't seem to be true in the standard rate filter. Using the results of these studies, Hill & Hill designed and constructed a waste treatment plant for the Welch Grape Juice Company which was put into operation January 1, 1957 and also additions to the North East Borough Plant, which was put into operation in August, 1957.

"In designing the two new plants the results of our study were taken into consideration. At the North East Borough plant a high rate filter was installed before the existing standard rate filter. The high rate filter will convert a large portion of the dissolved solids which will be removed before the flow reaches the standard rate filter. The standard rate filter is then to be used to remove the more difficult remaining solids. In both plants, the North East plant and the Welch plant, the settling capacity was concentrated in the secondary units to remove the solids after they had been converted from dissolved solids to suspended solids. It appears that flocculation is advantageous at this point."

Investigation and study was made of other types of treatment but it was found only trickling filters could stand the shock loads, high organic content and varying pH of these wastes and still give a high degree of treatment.

The majority of the cost of this plant which was financed by a bond issue, is to be paid for by the contributing industries, based on their flows and the strength of their wastes.

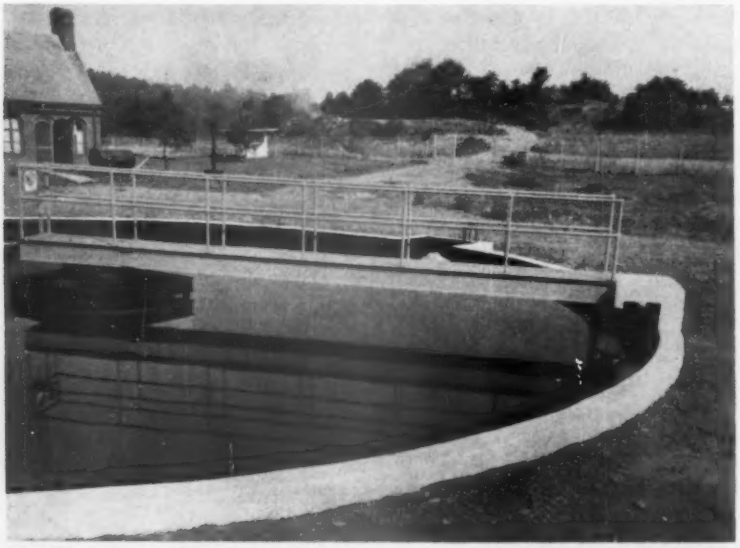
Individual measuring and sampling stations are set up at the Keystone Co-operative Grape Company; Sunshine Packing Company and the North East Packing Company. These wastes are analyzed and based on the strength and flows; the industries being billed monthly. The North East Dairy Company is also contributing to the cost of the new additions.

Ordinances

The Ordinances that govern the industrial waste charges for industries within the Borough are presented on the following page. The Ordinance governing the installation of sampling stations for gauging and sampling of the industrial wastes requires the industries to construct a gauging station on their industrial wastes equipped with a weir and a totalizing-indicating-recording meter and in addition a Trebler sampler. The Borough chemist reads these meters and collects samples periodically from which he determines the industrial waste charges.

Financing

The North East Borough Sewer Authority was appointed by the Borough Council. This Authority was appointed with the instruction from the Borough Council to finance and construct the needed improvements. The disposal plant and the sewer system are now leased back to the Borough for a 15 year period until the fiancing has been completed.



INTERMEDIATE SETTLING TANK. One of three new tanks for solids removal at the new disposal plant.

North East Ordinance No. 404

Sewer Charges—Industrial Wastes

Providing for an annual rental payable in monthly installments upon the use of the North East Borough Sewer System for the disposal of industrial waste, fixing the amount of such rental and the collection thereof.

BE IT ORDAINED AND ENACTED by the corporate authorities of the Borough of North East, Erie County, Pennsylvania, and it is hereby enacted by the authority of the same as follows:

SECTION 1. An industrial waste rental payable in monthly installments, in addition to all present and subsequent water and sewer charges, rentals or rates, shall be charged for the disposal of industrial waste through the means of the North East Borough Sewer System.

SECTION 2. The annual rental for use of the Borough of North East Sewer System for the disposal of industrial waste shall be determined in accordance with the following Rate Schedule:

Each industry shall pay on a load factor equal to waste rental based on the volume increased by their solids factor and pollution factor. The base rate shall be 10¢ per 100 gallons of volume multiplied by the solids factor and the pollution factor.

The Solids Factor shall be obtained by dividing the parts per million of suspended solids in excess of 150 parts per million by 150 parts per million (where 150 represents the permissable load allowed without payments of a premium) and multiplying it by a fraction representing the amount of solids removed, which in this case is one-half.

$$\text{Expressed in Formula: F equals } \tfrac{1}{2} \frac{(\text{PPM}-150)}{150}$$

The Pollution Factor shall be obtained by dividing the parts per million of biological oxygen demand (B.O.D.) in excess of 200 parts per million by 200 parts per million (where 200 represents the permissible B.O.D. load allowed without payment of a premium) and multiplying it by a fraction representing the required amount of removal, which in this case is four-fifths.

$$\text{Expressed in Formula: F equals } 4/5 \frac{(\text{B.O.D.}-200)}{200}$$

The Load Factor on which payments shall be proportioned shall be the combination of the Solids Factor and the Pollution Factor. Expressed as follows:

$$\text{Load Factor equals 1 plus } \tfrac{1}{2} \frac{(\text{PPM}-150)}{150} \text{ plus } 4/5 \frac{(\text{B.O.D.}-200)}{200}$$

The solids and pollution factors shall be determined by periodical analysis of the waste of each industry by the Borough of North East.

SECTION 3. Rates, charges and rentals herein provided shall be billed in monthly installments, and shall be due and payable on or before the 15th day of the calendar month next succeeding the date of billing.

SECTION 4. (a) All rentals, charges or rates herein provided, or any part thereof shall be a lien on the real property of those using the North East Borough Sewer System for the disposal of industrial waste; and upon failure of payment within thirty days from the date of said payment becoming due as herein provided, the Borough may, at its option, discontinue said service.

(b) All rentals, charges or rates herein provided, and not paid as herein provided, may be collected by authority of all laws made and provided therefor; and especially as provided in "The Borough Code" as amended 1957, July 10, P.L. 1621 and its amendments thereto; and especially as provided by that certain act of Assembly relative to Municipal Claims, 1923, May 16, P.L. 207, 1929, April 30, P.L. 902 as amended 1945, April 17, P.L. 238 and its amendments thereto.

SECTION 5. (a) The following shall be prohibited from discharge into the sewers, either by industries or individuals;

Runoffs from roofs; surface drainage from ground or paved areas and/or discharge from ground water collection systems.

Gasoline cleansing solvents; fuel oil or any types of oil; ashes, sand, cinders or similar substances; tar, plastics or other viscous substances; mineral oils; feathers, hair or rags; metal, broken glass or shavings; unshredded garbage; toxic, explosive or malodorous gases; or acetylene generating sludge.

Toxic wastes containing solids, liquids or gases that are toxic to humans or that might become so under conditions existing in the sewers or treatment plant and consisting of cyanide wastes, iodine or iodine compounds, florine, chromates, vegetable or mineral dyes or other substances not named above, any of which are toxic to biological sewage treatment processes or are not readily or ordinarily removed by such processes.

No wastes shall be discharged that are strongly acid, excessively alkaline or that would be corrosive to the sewer system or other structures. No wastes shall be discharged without pretreatment that have a hydrogenion concentration of less than 5.5 or more than 8.5.

(b) Industrial waste permitted: Industrial waste shall be construed to mean any liquid, gaseous or solid substances, not sewage, resulting from the processing of vegetables, fruits, grains or other agricultural products, all of which will pass a screen of ⅛" openings.

(c) Sewage shall be construed to be sanitary waste flow derived principally from dwellings, business buildings, institutions and the like and containing the waste products, ground garbage or excrements from either humans or animals.

SECTION 6. The provisions of this ordinance are severable, and if any of its provisions shall be held invalid, the decision of the Court shall not affect or impair any of the remaining provisions of this Ordinance which would have been enacted had such invalid provisions not been included herein.

Enacted into an Ordinance this————day of August, 1956.

President of Borough Council

Ordinance Amendment

Amending Section Two of Ordinance No. 404 providing for an annual rental payable in monthly installments upon the use of the North East Borough Sewer System for the disposal of industrial waste, fixing the amount of such rental and the collection thereof.

BE IT ORDAINED AND ENACTED by the corporate authorities of the Borough of North East, Erie County, Pennsylvania, and it is hereby enacted by the authority of the same as follows:

SECTION 1. Section 2 of Ordinance No. 404 is amended to read as follows:

Section 2: The annual rental for use of the Borough of North East Sewer System for the disposal of industrial waste shall be determined in accordance with the following rate Schedule:

Each industry shall pay an industrial waste rental

based on the volume of industrial waste multiplied by its solids factor and its pollution factor. The base rate shall be 13c per 1000 gallons of volume multiplied by the solids factor and the pollution factor.

The Solids factor shall be obtained by dividing the parts per million of suspended solids in excess of 150 parts per million by 150 parts per million (where 150 represents the permissible load allowed without payment of a premium) and multiplying it by a fraction representing the amount of solids removed, which in this case is one-half.

$$\text{Expressed in Formula: F equals } \tfrac{1}{2} \frac{(\text{PPM}-150)}{150}$$

The Pollution Factor shall be obtained by dividing the parts per million of biological oxygen demand (B.O.D.) in excess of 200 parts per million by 200 parts per million (where 200 represents the permissable B.O.D. loan allowed without payment of a premium) and multiplying it by a fraction representing the required amount of removal, which in this case is four-fifths.

$$\text{Expressed in Formula: F equals } 4/5 \frac{(\text{B.O.D.}-200)}{200}$$

The Load Factor on which payments shall be preportioned shall be the combination of the Solids Factor and the Pollution Factor. Expressed as follows:

$$\text{Load Factor equals 1 plus } \tfrac{1}{2} \frac{(\text{PPM}-150)}{150} \text{ plus } 4/5 \frac{(\text{B.O.D.}-200)}{200}$$

The solid and pollution factors shall be determined by periodical analysis of the waste of each industry by the Borough of North East.

Section 2: All ordinances or parts of ordinances conflicting herewith are hereby repealed.

Section 3: The provisions of this ordinance are severable, and if any of its provisions shall be held invalid, the decision of the Court shall not affect or impair any of the remaining provisions of this ordinance, which would have been enacted had not such invalid provisions been included herein.

New Library Reference

A new book, *Trouble-Free Hydraulics* by Ian McNeil, AIME, published by the Ronald Press Co., 15 East 26th Street, New York 10, N. Y., totals 124 pages and is available at a price of $6.50.

The book, written to serve as a practical hand book on maintenance and fault finding in oil hydraulic machinery is applicable to all forms of hydraulic machinery. It has 34 tables, 23 line drawings and 12 fault finding charts which serve for ease of reference in obtaining concise information.

Personnel dealing with maintenance and protection of water and sewage works equipment will find this book a valuable source of information. The author's objective, as summarized in his book, is to provide information on the two practical aspects which answer the questions:

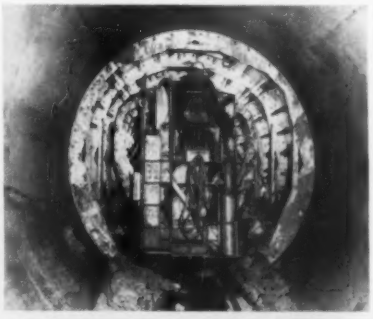
1. "What maintenance is required to prevent machine breakdown and provide the best operating condition? How, and at what intervals should it be carried out?"
2. "If a fault or a breakdown arises in hydraulic machine how can the cause of the trouble be traced and what remedy should be applied?"

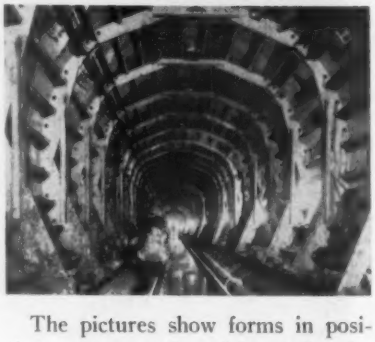
Water Conduit Built Underground

The Cannonsville Project is a 45-mile length of 11⅓-foot diameter, concrete lined, water conduit being built 400 to 600 feet underground for the New York City Board of Water Supply.

A total of 600,000 cubic yards of concrete is scheduled for tunnel placement. Every 24 hours, five days a week, 500 feet of arch is being poured, along with 1,000 feet of invert and 600 feet of curb.

Forms, bridges and platforms for concreting were designed and fabricated by Blaw-Knox Co., Pittsburgh. At the current rate of pour, a 30-foot long section of form is stripped, collapsed, moved to shaft end of the tunnel and set every 45 minutes.





The pictures show forms in position and one section of forms, in telescoped position, being moved away from cured concrete through inposition forms.

Environmental Sanitation in Practice

Environmental Sanitation by Joseph A. Salvato, Jr., emphasizes practical application of sanitary engineering theory and principles for controlling the rural and suburban environment.

Written by a professional engineer who has had over twenty years of practical experience in the application of the fundamentals of environmental sanitation and sanitary engineering, this book is comprehensive in scope and directly applicable to conditions actually encountered in the smaller community, installation, or facility of less than 1000 to 5000 persons. A special effort has been made to include planning, design, construction, maintenance, and operation details, as well as administration of environmental sanitation activities.

The book is a comprehensive treatment of the major phases of man's efforts to control his environment. It deals with control of communicable diseases; location and planning; water supply; sewage and waste treatment and disposal; swimming pools and bathing beaches; food; insects, rodents, and noxious weeds; housing; and the organization, reporting, evaluation planning and enforcement by health departments. The book has 660 pages and is available from John Wiley & Sons, Inc., 440 - 4th Ave., New York 16, N. Y., at a cost of $12.00.

CHLORINATION GUIDE

This fourth of a series of articles on chlorination practices is devoted to the emergency aspects of chlorine use, or briefly to . . .

Safety in Chlorine Handling

by EDMUND J. LAUBUSCH, Sanitary Engineer,
The Chlorine Institute*, New York, N. Y.

AUTHOR'S NOTE: The purpose of this series** of articles is to review briefly the fundamental principles of the chlorination processes, especially as they relate to conventional water and wastewater treatment practices; to point out some of the principal hazards and flagrant abuses that are associated with chlorine use, and various means by which these can be minimized or corrected; and to delineate, in a practical way, safe and effective handling techniques using equipment evolved from the cautious but rapid advancement of the science and art of chlorination.

Part III** focused attention on a number of established safe practices associated with the handling and use of chlorine. This article relates principally to the physological effects of accidental exposure to chlorine and the means by which these exposures and their effects can be minimized.

■ ONE OF THE GREATEST HAZARDS associated with the use of chlorine is that, in becoming a familiar part of a process, it is often forgotten that it is a potentially dangerous material. Unconfined chlorine presents a very serious situation and constant vigilance must be exercised to avoid its devastating action on life and property.

Physiological Considerations

Chlorine Gas. Chlorine gas usually is considered to be a respiratory irritant. Exposure may cause varying degrees of irritation of the mucuous membranes, the respiratory system, and the skin. Relatively small amounts of chlorine can be detected because of the characteristic, penetrating odor of the gas; larger amounts cause eye irritation, coughing, and labored breathing. If the duration of exposure or the concentration of chlorine gas is excessive, general excitement of the exposed person will result and will be followed by restlessness, throat irritation, sneezing and copious salivation. The symptoms of advanced stages of exposure are retching and vomiting followed by difficult breathing. In extreme cases, the difficulty of breathing may increase to the point where death can occur from apparent suffocation. High concentrations of chlorine gas have a corrosive, irritating action on the skin, but such irritation of a conscious person generally occurs only when prolonged exposure is tolerated by the use of suitable respiratory protection.

Liquid Chlorine. Liquid chlorine in commerce is a moisture-free, liquified form of the element confined under its own vapor pressure in suitable containers. (See Part III). Under atmospheric pressure it boils at minus 30°F, changing to the gaseous state. At 68°F its vapor pressure is about 82 psi (gage). Since it vaporizes with extreme rapidity under normal atmospheric conditions, liquid chlorine is rarely seen.

If pressurized liquid chlorine containers leak or are accidentally ruptured, gaseous chlorine evolves, and all of the effects of the gas described above might result. In unusual cases, liquid chlorine may splash on the clothing and skin causing irritation and chemical burns.

Effects of exposure. Chlorine is particularly irritating to persons afflicted with asthma and certain types of bronchitis; such persons should not be employed where it is possible to be exposed to chlorine. Most other

* The Institute and its members make no guarantee of results and assume no liability, joint or severally, in connection with the information herein contained or the safety suggestions herein made.

** See *Wat. & Sew. Wks.*, Vol 105, p 411 (Part I); Vol 105, p. 509 (Part II); and Vol. 106, p. 71 (Part III).

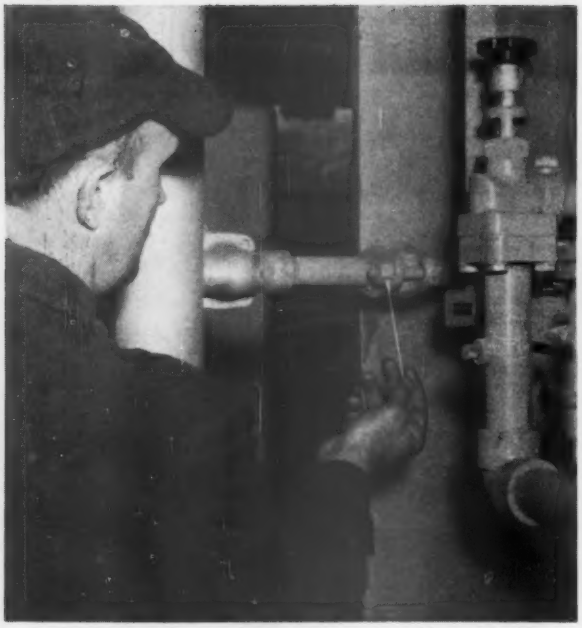
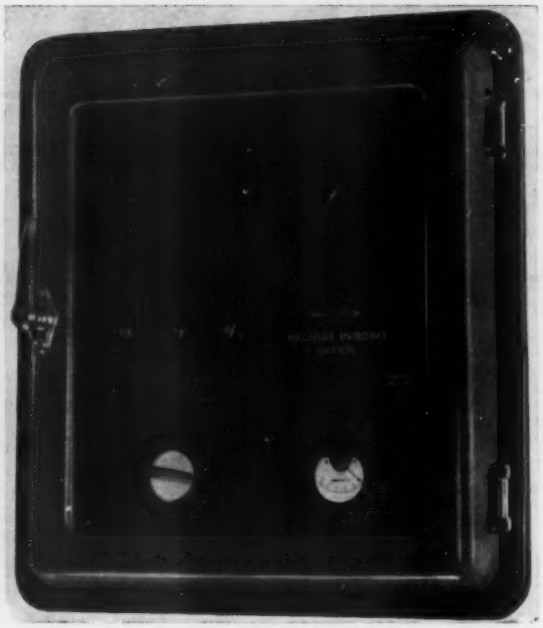


FIG. IV-1. AMMONIA swab test for chlorine leaks



Courtesy Wallace & Tiernan, Inc.

FIG. IV-2. SOLVAY chlorine detector, manufactured by Wallace & Tiernan, Inc. can be equipped to actuate an external audible alarm.

intelligent, trained persons may be assigned to areas where chlorine is handled.

The principal physiological effects of various concentrations of chlorine gas are shown in Table IV-1. Concentrations of one part of chlorine gas in 1,000,000 parts of air (by volume) may produce slight symptoms after several hours exposure. The American Conference of Governmental Industrial Hygienists fixes as a guide the repeated 8-hour exposure threshold limit of chlorine at maximum of 1 ppm by volume in air.

Reducing Exposure. The characteristic odor of chlorine gas gives warning of its presence in the atmosphere at low concentrations. A greenish-yellow color is visible at high concentrations. Several hours exposure in the atmosphere containing chlorine at a concentration below that which can be detected by sight or smell, however, can produce slight irritation, and other means of leak detection should be employed for the protection of persons continuously exposed to chlorine handling operations, especially in confined areas.

There is little likelihood that anyone would purposely remain in an atmosphere seriously contaminated with chlorine if he is conscious and able to escape. Serious injury may result, however, if escape from the gas is not possible. Under such conditions approved respiratory equipment should be properly donned at once.

While seeking an escape, or while respiratory equipment is being secured and adjusted, short, shallow breaths should be taken and eyes should be closed as much as possible. Chlorine gas is about 2½ times heavier than air and tends to concentrate at or near grade level; it is important to keep above and to the windward side of escaping chlorine vapor.

Handling Chlorine Leaks

Leak Detection. Leaks may be detected by exposing an ammonia-moistened swab or aqueous ammonia aerosol spray near all chlorine connections (See Fig. IV-1). The formation of a white cloud (ammonium chloride) is evidence of a chlorine

Table IV-1

Physiological Effects of Various Concentrations of Chlorine Gas

Approximate ppm*	Concentration mg/l	Effects on Unprotected Person
3.5	0.010	Least detectable odor
15.1	0.044	Least amount required to cause irritation of throat
30.2	0.088	Least amount required to cause coughing
1.0	0.0029	Least amount required to produce slight symptoms (of poisoning) after several hours exposure
4.0	0.012	Maximum amount that can be breathed for one hour without serious disturbances
40-60	0.12-0.17	Amount dangerous in 30 minutes to one hour
1000	2.9	Amount likely to be fatal after a few deep breaths

* parts of chlorine gas per million parts of air, by volume
Reference: Bureau of Mines Technical Paper 248, "Gas Masks for Gases Met in Fighting Fires"

Courtesy Solvay Proc. Div. Allied Chemical Corp.

FIG. IV-3. EMERGENCY kit contents. Steel chest (background) has "car door seals" to discourage tampering with contents.

leak. Frequent inspection of loaded containers, whether attached to chlorine delivery lines or not, is advisable. A small leak detected in its early stages often can be easily stopped by applying known remedies. Chlorine leaks always get worse if they are not corrected promptly.

There is available a chlorine gas detector (See Fig. IV-2) which can be used in any location where chlorine is stored or used. Operation of this device is based on the continuous sampling of a controlled volume of air in a chamber, and electronic measurement of the color intensity of a chemically-treated test paper which darkens when exposed to chlorine gas. A visible alarm is energized when the paper is darkened to an equivalent of about 3 ppm by volume chlorine.

Preliminary Management. Whenever there is any indication of a chlorine gas leak, the ventilating system should be turned on and steps should be taken to correct the condition. *All* leaks should be investigated at once by authorized, trained personnel equipped with suitable respiratory protection. All other persons should be kept away from the affected area until the cause of the leak is discovered and the difficulty corrected. If the leak can not be readily managed, the chlorine supplier or any chlorine producer should be called immediately for expert guidance and assistance.

The management of chlorine leaks depends on the location of the leak within the installation and its severity, the consequences of interruption of the chlorination process, and other factors. In general, when a leaking chlorine container is discovered the container valve (or angle valve on tank cars) should be closed immediately, the delivery line should be evacuated to the process, and other necessary precautions should be observed to ensure safety before initiating repairs and resuming operations. There are situations, however, where a totally different procedure might be indicated. It is best to provide a definite plan which can be put in operation when emergencies of each conceivable type occur. The chlorine supplier and the Chlorine Institute can provide valuable assistance in developing these emergency plans.

Wherever possible, leaking chlorine containers should be positioned so that gas, rather than liquid, is discharged since one volume of liquid chlorine yields approximately 460 volumes of chlorine gas.

Water should never be sprayed on a chlorine gas leak as it is likely to

Courtesy Mine Safety Appliance Co.

FIG. IV-4. TESTING face piece of industrial canister-type mask for leaks.

Courtesy Mine Safety Appliance Co.

FIG. IV-5. CHEMOX self-generating oxygen breathing apparatus.

get worse due to the corrosive action of chlorine and water.

Emergency Devices. The Solvay Process Division, Allied Chemical Corp., and the Hooker Chemical Corp. market emergency kits for repairing nearly all conceivable leaks on chlorine cylinders, ton containers and tank cars. All persons who might reasonably be expected to use such equipment should be thoroughly familiar with it and trained as to its applicability and limitations. These kits (See Fig. IV-3) should be inspected frequently and after each inspection, they should be sealed in a chest provided for the purpose in such a manner that will discourage tampering and provide evidence that the contents are intact. A car door seal is recommended for this purpose. The ready availability of such equipment at the site of chlorine use, especially at large or remote sanitary installations, may facilitate emergency repairs.

If an emergency kit is not available, pin hole leaks in cylinders and ton containers may sometimes be temporarily stopped by driving a tapered, hard-wood peg or metal drift pin in the hole. The container should first be positioned so that only gas is escaping. Extreme care should be exercised in driving the plug, as the wall area surrounding the hole may be thin and crumble, thereby worsening the condition.

After such emergency measures are applied, the chlorine supplier should be contacted to determine how the container and its contents should be handled. It is illegal to ship leaking chlorine containers.

Caustic Absorption. At regular points of storage or use, emergency preparations for the disposal of chlorine from leaking cylinders or ton containers should be made. Chlorine can be absorbed in caustic soda, soda ash, or a hydrated lime solution; caustic soda is recommended as it absorbs chlorine most readily. The proportions of alkali and water preferred for this purpose are shown in Table IV-2. Chlorine is absorbed by bubbling it into the alkali through an iron pipe or rubber tube properly weighted to keep the end submerged.

The Chlorine Institute has no recommendation relative to the provision of alkali-absorption immersion pits. A few states require or recommend that they be available at all plants where chlorine is used. Some pits are known to have been installed but there is no available record that any

Table IV-2

Recommended Alkaline Solution for Absorbing Chlorine[1]

Chlorine Container Net Weight-lb	Caustic Soda lb-100%	Caustic Soda gal H_2O	Soda Ash lb	Soda Ash gal H_2O	Hydrated Lime* lb	Hydrated Lime* gal H_2O
100	125	40	300	100	125	125
150	188	60	450	150	188	188
2000	2500	800	6000	2000	2500	2500

*Must be agitated continuously with vigor while chlorine is to be absorbed

of these ever have been used. If cylinder or ton container immersion in a caustic pit is provided, the hydraulics and physical arrangements must be such that they be kept submerged until the contents have been evacuated. Local conditions must be considered in determining the need for and the most satisfactory means of providing such emergency facilities.

Others. The use of a two-inch water ejector connected to a high-pressure water supply system, and equipped with a suitable length of two-inch rubber hose that has a large rubber funnel on the end has been recommended for sucking away most of the chlorine gas from a leak.[2] Discharge from the ejector can be to a raw-water channel, a sewer, or other points where harmful conditions will not be created.

Respiratory Protection

Respiratory protective devices of a type approved by the U. S. Bureau of Mines for chlorine service always should be readily available where chlorine is being stored or transported or used. They should be located outside the probable area of contamination so that it will be possible to reach them in an emergency. Where chlorine is used over wide areas masks should be available in several convenient and accessible locations.

All personnel that may be involved in using respiratory protective devices should be properly instructed in their application and use. Regular rehearsals, which include the entire testing procedure and wearing of the equipment, may help to save the life of an employee faced with an emergency.

Respiratory protective devices are of four basic types: (1) self-contained breathing apparatus, (2) industrial canister-type masks, (3) hose masks (supplied-air respirators), and, (4) combinations of (1) and (3). All have a molded flexible facepiece with a transparent window (s) which varies widely in size and shape. Eye protection is imperative due to the irritating nature of moist chlorine gas or liquid chlorine splashes. Provision for exhaust air is accomplished by various types of valving devices which remain tightly closed during the intake cycle of breathing.

Connections between the facepiece and other parts of the apparatus utilize a flexible tube(s) which permits free head movement. This tubing should be visually inspected and performance-tested at frequent intervals, certainly at least quarterly.* If leaks in the facepiece, tube, or tube connections can not be eliminated by tightening the head straps, the complete facepiece and attached flexible tube must be replaced. A defective or inoperable mask is worse than none at all.

Self-Contained Breathing Apparatus. This apparatus contains or generates its own supply of air or oxygen. It is suitable in an oxygen-deficient atmosphere provided no gas is present that poisons by skin absorption; thus, they are suitable for chlorine. Such apparatus operates only for a specified length of time. As of April 1, 1957, the following are approved by the Bureau of Mines for chlorine service [3-5]**.

Mine Safety Appliances Co. (Pittsburgh, Pa.)
- *Chemox* oxygen breathing apparatus
- *M.S.A.* demand-type oxygen breathing apparatus
- *M.S.A.* demand-type compressed air breathing apparatus

Scott Aviation Corp. (Lancaster, N. Y.)
- *Scott Air-Pak* self-contained breathing apparatus

The *Chemox* apparatus (See Fig. IV-5) is an oxygen-generating device which utilizes the moisture in the user's breath to activate an oxygen-generating compound contained in a replacable canister where carbon dioxide also is absorbed. It is equipped with a 45-min timer which may be set to indicate the period of usable service remaining. This unit must be stored and started at temperatures above 32°F.

The McCaa oxygen breathing apparatus (See Fig. IV-6) consists essentially of a cylinder containing a

Courtesy Scott Aviation Corp.

FIG. IV-6. McCAA two-hour oxygen breathing apparatus.

* To test for leaks pinch off the connecting tube near the facepiece and inhale slowly. If the mask and tube connection is airtight, the facepiece will collapse. To check the condition of the connecting tube, pinch the tube near the connection farthest from the facepiece, inhale slowly, and observe as before (See Fig. IV-4).

** Company names are arranged alphabetically

Courtesy Scott Aviation Corp.

FIG. IV-7. AIR-PAK self-contained breathing apparatus (front and back view).

two-hour supply of oxygen under pressure; valves to control the pressure and circulation of oxygen; a cooler and rubber breathing bag that functions as a low-pressure oxygen reservoir; and, a regenerator for purifying the expired breath and removing carbon dioxide.

The *M.S.A.* demand-type apparatus utilizes compressed air or oxygen, and the *Scott Air-Pak* utilizes compressed air (See Fig. IV-7) supplied to the user from a back-carried, refillable, 40-cu ft cylinder that is sufficient for 30 min use at extreme exertion. These units feature a demand regulator with a gauge which gives a continuous indication of the air supply remaining. Protection against regulator failure is afforded by an emergency by-pass valve which allows a constant flow of air to the mask.

Industrial Canister-Type Masks. These masks (See Fig. IV-8) are used extensively in the sanitation field, but they are unsuitable in any atmosphere containing in excess of about 1 per cent or 10,000 ppm by volume of chlorine. The canister removes contaminants during inhalation but does not supply oxygen; if used in situations where oxygen is not present in life-supporting concentration (16 per cent), suffocation will result. For example, the rupture of a chlorine container coincident with oxygen-consuming fire would clearly indicate the use of a self-contained or supplied-air protective device in combatting the emergency.

The service life of a canister depends on the size of the unit, the chlorine concentration and humidity of the atmosphere to which it is exposed, and the rate of breathing. It usually varies from 15 min or less at high concentrations up to several hours at very low concentrations. Canisters older than four years are unreliable and should be discarded. Canisters installed in the mask proper *with seals broken* to render the unit immediately available do not retain their chlorine-absorptive capacity and must be replaced immediately after use or within one year in any case.

Spare canisters should be stored in a cool, dry, accessible place, with seals intact, and dated so that rotation of new supplies is possible.

The following companies* manufacture canister masks for chlorine service that are approved by the U.S. Bureau of Mines.

Acme Protection Equipment Co.
1201 Kalamazoo St.
South Haven, Mich.

E. D. Bullard Co.
2680 Bridgeway
Sausalito, Calif.

Davis Emergency Equipment Co.
45 Halleck St.
Newark 4, N. J.

Mine Safety Appliances Co.
Braddock, Thomas and Meade Sts.
Pittsburgh 8, Penna.

Willson Products Division
Ray-O-Vac Co.
Reading, Penna.

Hose Masks. Hose-type supplied air respirators supply fresh air continuously through suitable hose, having its intake in an uncontaminated area, to the facepiece. They are operated by natural breathing with hose lengths up to about 20 ft; beyond this limit a hand- or motor-operated blower is required. Hoses usually

* Company names are arranged alphabetically.

Courtesy E. D. Bullard Co.

FIG. IV-8. INDUSTRIAL canister-type mask for chlorine service.

Courtesy Acme Protection Equip. Co.

FIG. IV-9, SELF-CONTAINED demand breathing apparatus with auxiliary high pressure air line.

have a one-inch effective diameter to provide air to the user in event of a blower failure. These devices are suitable in any atmosphere, regardless of the degree of contamination or oxygen deficiency, provided that clean, breathable air can be reached within the permissible hose length. These devices are of the continuous flow type.

Demand-type hose masks, which supply air to the facepiece (at a rate governed by breathing) of the user only when he inhales. Air supply for this device can be full-sized compressed air cylinders or a compressor. As for continuous flow type units, the air supply must be suitable for respiration. These devices are similar in principle to the self-contained breathing apparatus already described except that the air supply is remote from the user.

Other. Combination units are available which consist of a self-contained demand air unit with a reinforced, high-pressure hose through which air is supplied to the demand regulator from remote air cylinders or a compressor (See Fig. IV-9). In event that escape is not possible through the path of entry, the air hose can be disconnected and escape made using air supplied by the demand air unit on the user's back.

First Aid

The following first aid measures are recommended by The Chlorine Institute[1] for persons that have been exposed to high chlorine concentrations and who are in need of treatment pending medical care.

1. Carry patient from the gas area. Patient should be kept in a warm room (about 70°F). Supply blankets if necessary. Keep patient warm and quiet. Rest is essential.

2. Place patient on back with head and back elevated. (Unless Item No. 7 is indicated)

3. *Call a physician immediately.*

4. Splashes of liquid chlorine and chlorinated water destroy clothing, and if such clothing is next to the skin, will provide irritation and chemical burns. In such cases remove clothes. Flush exposed areas with water if the condition of the patient permits it.

5. Oxygen administered under pressure is mandatory (when patient is breathing with difficulty). This treatment should be continued as long as the patient shows any tendency to have paroxysm of coughing. Instructions of the purveyor of the gas apparatus should be carefully obeyed.

6. Milk may be given in mild cases as a relief from throat irritation. (Nothing should ever be given by mouth to an unconscious patient.)

7. If breathing has apparently ceased, start immediately artificial respiration by one of the following methods, listed in order of preference. Do not exceed a rate of 18 cycles per minute.

(a) Back-pressure arm-lift method

(b) Prone pressure method (Schafer)

8. Provide first aid as may have been prescribed for emergencies by the plant physician pending his arrival.

References

(1) The Chlorine Institute, Inc. *Chlorine Manual,* New York, (1945)

(2) American Water Works Association, Inc. Safety Manual M-3: Safety Practice for Water Utilities. New York (1955)

(3) U.S. Department of the Interior: List of Respiratory Protective Devices Approved by the Bureau of Mines—Information Circular 7636 (June 1952)

(4) U.S. Department of the Interior: Bureau of Mines Approval System for Respiratory Protective Devices—Information Circular 7792 (June 1957)

(5) U.S. Department of the Interior: New Approvals (of Respiratory Protective Devices)—(April 1, 1957)

REPORT FROM ABROAD

RESERVOIR at Essen and Baldeney Ruhr, one of three which aid purification of the Ruhr River, is an example of one phase of the progress in . . .

Wastewater Technology *in Germany*

Part I

by Dr. Ing. H. RHODE, Chief Engineer
Ruhr River Association
Essen, Germany

EDITOR'S NOTE: As part of the practice of keeping our readers informed on what is going on outside of the United States, WATER & SEWAGE WORKS is pleased to present this first of a two-part article on recent progress in sewage treatment technics in Germany. This article, authored by a distinguished German engineer, is a summary and a survey of sewage treatment plant design and operation as it has been developed in West Germany over the past 15 years. Part II will appear in a forthcoming isue. Part I deals principally with primary sewage treatment. This article was obtained and translated by our Contributing Editor, Clarence E. Keefer of Baltimore, Md.

■ IN WEST GERMANY there are about 50 million inhabitants, of which 41 million are served by central water-treatment plants, but only 50 per cent or 25 million are served by municipal sewers and only 34 per cent of this municipal sewage is treated at sewage plants before it is discharged into watercourses. The treatment of sewage from only 17.5 million inhabitants indicates a vast amount of work that remains to be done in the sphere of sewage projects, although after the war it was possible to obtain real gratifying progress. It must not be overlooked that as a result of both world wars, in which Germany was directly concerned, at least half of the last 50 years were years of scarcity, during which not much could be done in the domain of sewage purification. In the last 5 years about $360,000,000 were spent by municipalities alone for

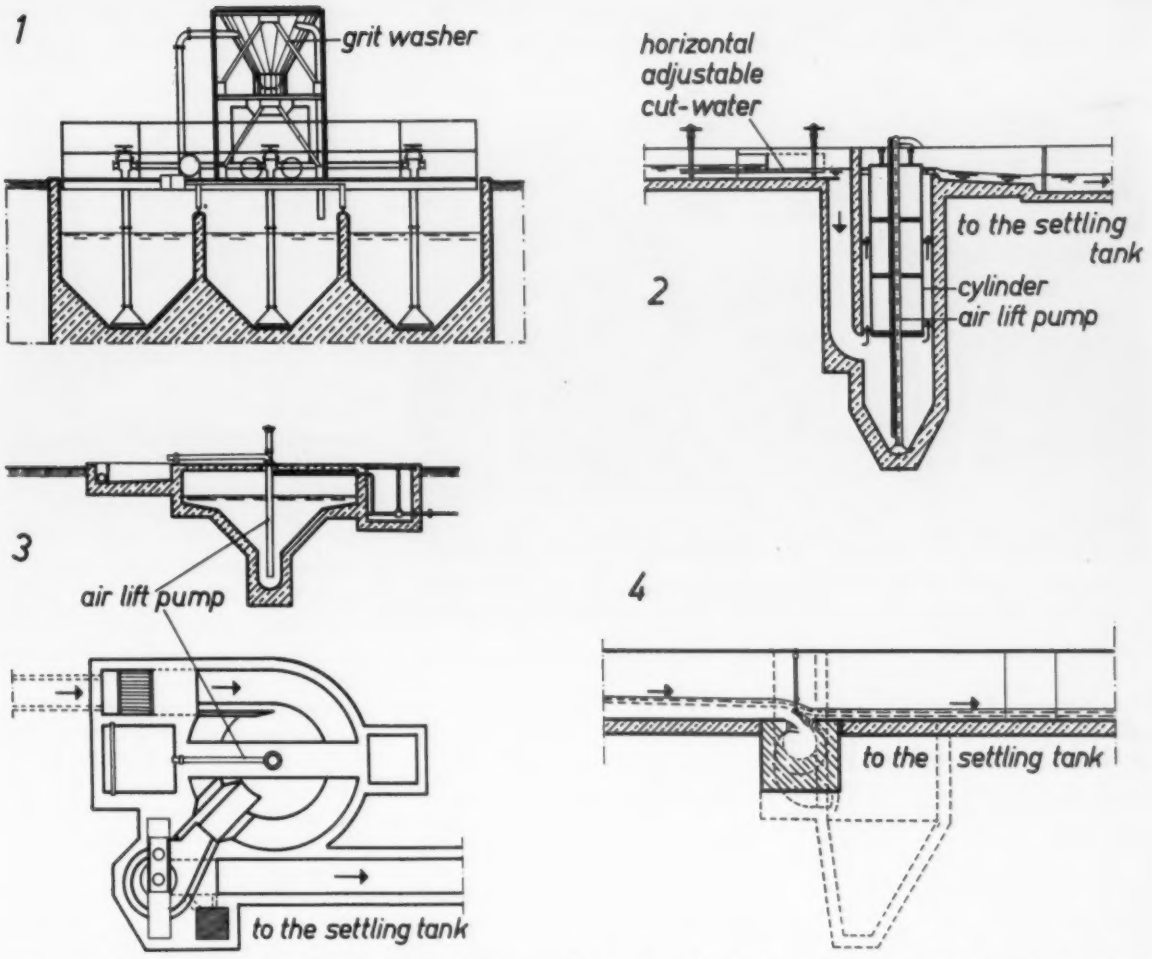


FIG. 1—GRIT CHAMBERS of different designs: 1. Horizontal flow-through chamber with mechanical cleaning equipmen. 2. Deep vertical flow-through chamber. 3. Circular grit chamber. 4. Stengel grit chamber.

sewer systems and sewage-treatment works in west Germany. Up to 1960, additional expenditures of $400,000,000 are forseen for this type of work.

The River Associations

In general, it was only recently possible to begin, on a vast scale, economic plans relating to water, but some decades ago there came into being an administration of water that was on a small scale and that was capable of being carried out. This organization, which was brought about by the force of circumstances in the Rhine-Westphalian industrial district, consisted of a cooperative association of all the designated cities, districts, mines and large industrial undertakings. The goal was to carry out both the water supply and maintenance of the purity of the watercourse and the drainage of the entire district in accordance with uniform plans, as well as all inclusive communal problems.

Thus originated the well known West German economic water associations, the oldest of which are the Ruhr River Association and the Emscher Corporation.

It is the special characteristic of these organizations that all economic measures relating to water are not only supervised and planned by them, but also that they are even executed and managed by them. So, before everything else, it is the business of the sewerage districts to plan, to build and to manage the sewage-treatment works required to treat the sewage for the cities situated in the district. Since the purification of the sewage is incumbent upon the whole drainage district, they are also able to carry out new kinds of treatment and to combine technical with economical measures.

Utilizing Stream Capacity

As an example, the raising of the Ruhr in a chain of great reservoirs, which was carried out first by Imhoff in the scope of the activity of the Ruhr River Association District, should be mentioned. By this means the flow-through time and the water surface of the river are increased, the water is exposed in greater volume to the light and the air, by means of which an intensive oxygen absorption can take place at the surface and the ability of the river to purify itself can be increased. A river, which is thus managed, is capable, after it leaves the dams, of receiving a greater sewage load than if such reservoirs were not built. One of these lakes is shown in the illustration at the head of this arti-

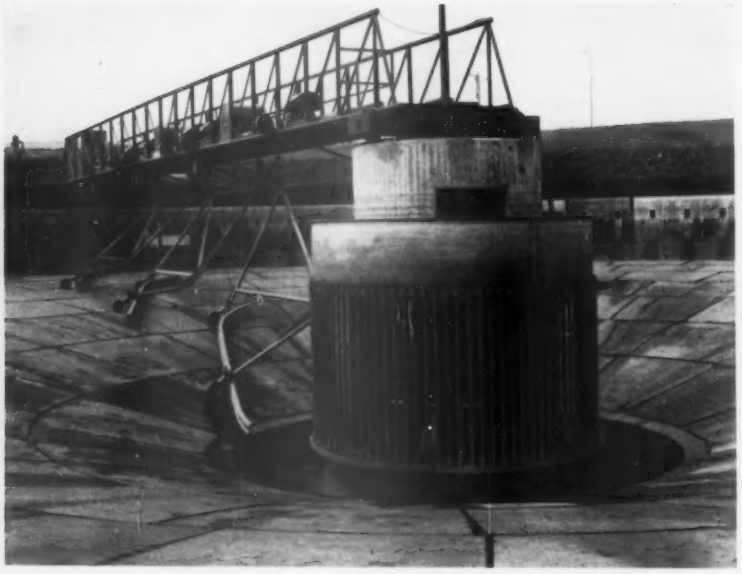


FIG. 2—SETTLING TANK at Duisburg-Schwelgern sewage-treatment works, Emscher District; Diameter: 116 ft. Bottom of tank is inclined parabolacally toward center. As structure is situated where there is settlement due to mines, effluent does not discharge over a horizontal weir but through vertical slots in outer wall.

cle. This particular lake on the Ruhr River has a capacity of 12 mil cu yd (approx. 2.5 bil gal). The Ruhr serves the Rhine-Westphalian industrial district.

These lakes are connected with hydro-electric plants and in one case with a power plant having an elevated storage basin. Through the sale of electric energy, obtained from these hydro-electric plants, the interest on the construction costs of the reservoirs in the Ruhr was to a great extent compensated for, and these costs were cancelled. Therefore the cost of purifying sewage by natural means in these impounded reservoirs is almost nothing.

Fundamentally, new kinds of clarification treatment have not developed during the last decade in Germany. In any case considering water management, the result obtained and the manner of using the river, simple mechanical removing of sludge from the sewage, often assisted by permanent or temporary chemical precipitation has been satisfactory. In recent years, complete biological treatment of the sewage has also been used. The focal point of technical development rests, at present, in the area of the secondary biological treatment of sewage, especially activated-sludge treatment and in sludge treatment; these developments are presented in Part II.

Grit Chambers

Since sewage-treatment plants not only must treat the dry weather flow but also the rain water in greater amounts than formerly, a grit chamber has to perform an especially difficult task. It must continually separate from the sewage flow only the specifically heavier sand but let pass the lighter sludge in spite of the markedly fluctuating flow of sewage. In Germany during rainy weather five times the dry weather flow is treated at the sewage plant in sedimentation tanks and one to 1.5 times the dry weather flow is given full biological treatment.

In order to obtain a somewhat equal loading of grit chambers at the different plants in the Ruhr District a horizontal projection is arranged in the inlet channel to the grit chamber to segregate the lower part of the stream of sewage carrying the sand and to direct it alone through the grit chamber. The remainder of the sewage is diverted through a by-pass.

Besides the approved horizontal flow-through shallow grit chamber, the vertical flow-through deep grit chamber, the spiral-shaped flow-through grit chamber and the Stengel grit chamber have been introduced in recent years. These various grit chamber designs are shown in Fig. 1.

In long horizontal flow-through grit chambers (Fig. 1-1) which do not have mechanical cleaning and which are especially considered for small cities and districts, the velocity of the sewage is said to remain approximately constant under varying conditions of flow. The adjustment of the velocity in the grit chamber for different flows is attained by means of a suitable formation of the cross-section and of the discharge end of the chamber. The chamber is so designed that during dry weather only one chamber is in service and during rainy weather several chambers are used. At other sewage plants either the profile of the channel is regulated at the end of the grit chamber, as has been done for example at the Dülken sewage-treatment plant in the Niers District, or one provides for a Venturi constriction to regulate the depth of the sewage in the grit chamber.

In recent years, the Ruhr River Association has provided, at a few sewage-treatment plants, a vertical flow-through grit chamber (Fig. 1-2) with the above-mentioned projection, the height of which is adjustable at the inlet end. By this means, the grit chamber is continually loaded to approximately the same degree, and sludge can not settle with a smaller volume of sewage flowing through the chamber. Regulating the increasing velocity of the water—at the most from 4 to 6 in. per second — is accomplished by means of a cylindrical tin partition, hanging from above. The sand, which collects in the apex, is removed by a compressed air pump.

In round grit chambers (Fig. 1-3) the sewage enters tangentially a circular compartment and again flows out over a wide opening in the wall after flowing through a central angle of over 180°. To aid the movement of the sand towards the center by means of the spiral current and to obtain at the same time a sufficiently large collecting space, the floor is formed in the shape of a funnel and along the axis a cylindrical sump with a compressed-air pump is provided.

In the type of diagonal grit chamber originated by Stengel (Fig. 1-4), at the end of a quiescent zone the lower stratum of sewage, carrying sand, is directed into a diagonal drain by means of an adjustable foot valve, into which the diagonal component

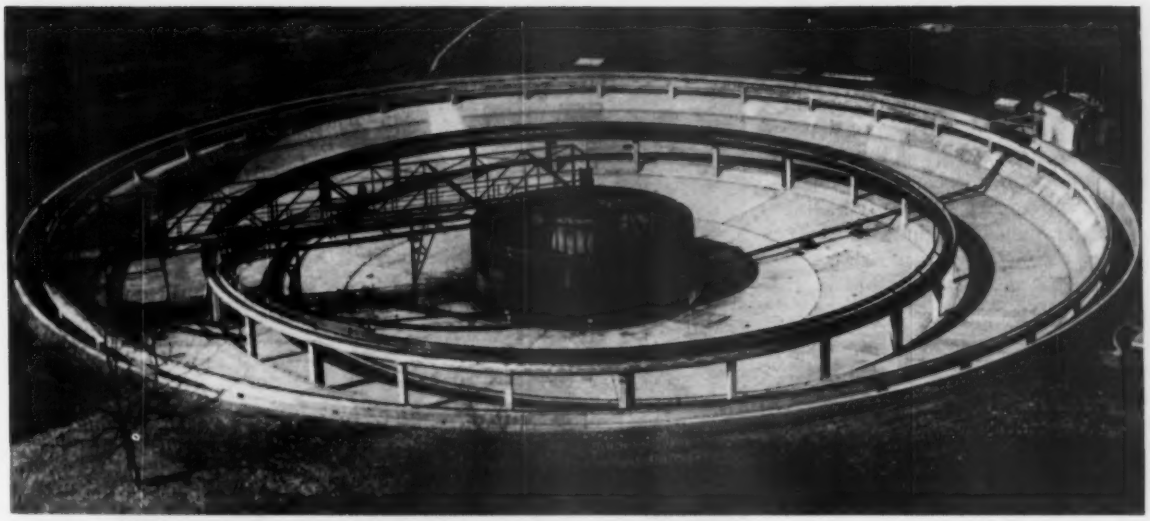


FIG. 3—PRIMARY settling tank under construction at Hagen. Diameter: 152.5 ft. Clarified sewage discharges not only at perimeter of tank, but it is also collected by additional intermediate discharge channel. At middle of tank sewage is aerated by perforated tubes before reaching real settling compartment, which is separated from aeration compartment by stilling lattic work.

of the therein produced spiral stream provides for the discharge of the sand. The diagonal drain flows into a storage compartment for sand, after the energy of the current of that part of the stream carrying the sand is dissipated. From there on the sand is withdrawn by a compressed-air pump, while the sewage is conveyed again over a by-pass to the main conduit.

In connection with the structures which are equipped with a compressed-air pump to withdraw the sand, it has proven advantageous to regulate the grit chamber at the inlet side of the basin at the upper part thereof. If the nature of the extracted mixture of sand should not be satisfactory, it is simple to return a part or even all of it back to the influent conduit of the grit chamber.

Settling Tanks

Settling tanks constitute the most important part of every treatment plant. Their outer form has hardly changed in the last decade. Circular settling tanks with a diameter of 80 ft or more and with spiral-shaped sludge removal equipment were favored for primary and secondary tanks. The opinion is held in Germany that circular tanks may be less costly to build and may be operated easier and with less trouble than rectangular-shaped tanks. At smaller and medium-sized plants, however, the preference is often given to rectangular-shaped tanks, because, in circular tanks, too little distance is allowed between the inlet at the center of the tank and the edge of the discharge channel surrounding the tank.

Vertical-flow, so called Dortmund tanks, are to be preferred for secondary tanks. Emscher tanks (Imhoff tanks) are still built today in Germany, as was the case 50 years ago, for small cities on account of their simplicity and because the sludge question is solved at the same time.

In recent years, in the Ruhr District, settling tanks are so sized that during rains the greatly augmented (mostly five fold) dry weather flow is still sufficiently freed of sludge by a detention period of about ¾ hr. By this means, special storm water settling tanks are not needed and at the same time the effect of industrial wastes are mitigated and sedimentation is favored.

Great efforts have recently been made to increase the efficiency of settling tanks by special improvement in the construction of influent and effluent conduits. In accordance with the Geiger method of construction at the entry of the sewage plant at Karlsruhe, the sewage is introduced into settling tanks through short pipes, which are inclined downwards, at the ends of which T-shaped inlets are fastened.

Recently these inlets have been made of concrete. These inlets are intended especially for large circular tanks, whereby the concrete influent conduits, (arranged in two rows lying one over the other) are concreted with a corresponding elimination of the partition at the center of the structure.

The so-called Stengel influent conduits of the Passavent Company are similarly constructed. That inlet consists of an entrance chamber and distributing pipes with a ball, shaped like a skullcap, in front thereof, which serves as a recoil disk. In the entrance chamber the water is said to back up and from here on it flows through the pipes equally divided, under a certain pressure, into the settling tank. The influent pipes are placed at about half the depth of the basin.

The Emscher District has developed, for some of its sewage-treatment plants, vertical inlet and outlet partitions (Fig. 2) with slots. This design takes into account the effect of unequal settlement of buildings in the district, where there are mines that settle.

Similar results are obtained if an aeration zone is provided in the middle of a structure around the discharge from a siphon or directly at the inlet side of a rectangular basin as has been done in the Ruhr District at some of its plants (Fig. 3). This design also obtains the advantage of a short period of preaeration, of the sewage before settling and this treatment can

be augmented by continuous or intermittent chemical precipitation. The aeration chamber is separated from the settling chamber by suspended, oscillating, flat iron bars, spaced at intervals of about 0.6 in. In this manner, there is formed single or double stilling and distribution partitions behind the influent conduits and before the real settling chamber.

Likewise with reference to the discharge end attempts have been made to increase the efficiency and the effectiveness of settling basins by vertical discharge slots or manifold overflow weirs, which have the function of reducing the rate of overflow for each foot of weir length.

Notched weirs serve the same purpose of always having sufficient overflow height in the notch at the time of greatly decreased flows or during strong winds. By this means the basin likewise remains still fully effective (Fig. 4) during abnormal operating conditions. The number of notches must be ascertained so that with the smallest flow of water, for example at night, the depth of water in the notch amounts to from 0.6 to 0.8 in.

At a few plants, the Ruhr River Association District has constructed in rectangular secondary settling tanks, aprons of light plates of synthetic material, extending down in the basin to different depths at the manifold discharge channels to apportion to some extent to each channel a definite part of the basin and to attain a more vertical current.

Furthermore, the Ruhr River Association District has provided two separate influent siphons at some two-step activated-sludge plants (the rain water flow, amounting to more than 1.5 times the dry-weather flow, is purified mechanically in the settling basin of the first step during rainy weather). These two influent siphons at the inlet structure in the center of the basin (Fig. 5) are for dry weather flows and for more than 1.5 fold of the rain water flow, which flows are united in a common orifice. In this way, it is possible to avoid a dangerous backing up of the sewage in the aeration tanks in service.

FIG. 4—FINAL settling tank with several effluent channels under construction, Hagen sewage-treatment works, Ruhr District. Diameter: 137 ft. Notched overflow weir fastened to channel at wall.

Sludge Removal

The slope of the bottoms of settling tanks ranges from 1:10 to 1:200. Rectangular basins are specified with bottoms having slopes from 1:100 to 1:200. The Emscher district has specified at one plant that the bottom of one basin be not cone-shaped but have a parabolical curved meridian cross-section. The increase in water depth is not rectilinear but becomes continually greater towards the center of the tank. The removal of sludge is said to be improved, accordingly.

For the same reason sludge scrapers in recent years in circular basins are made spiral shaped. Since the mass of heavy sludge in large basins settles out in the vicinity of the center, a second shorter scraper arm is often arranged in the zone around the inlet in front of the spiral-shaped sludge squeegee. This squeege sweeps the whole surface of the basin as well as close by the elongated sludge scraper bridge in order to double the tank performance in this greatly loaded zone and thus reduce the detention time of the sludge in the settling basin, (sludge detention time is important in connection with the long time required to make one revolution in the case of large sludge removal equipment).

The sludge collecting space in settling tanks is generally specified to be much larger than in the United States. They are made so large that they have to be cleaned only one or two times daily. By this means a very good thickening of fresh sludge is obtained. Special thickeners for fresh sludge exist therefore only for use at a few plants.

The fresh sludge is drained off by the natural transfer of water from the sludge pockets of the settling basins and is conveyed by non-clog centrifugal pumps, or pneumatically over a pressure chamber, into sludge digesters.

A different condition exists in the secondary settling tanks at activated-sludge treatment plants. There the sludge in the settling basin is, as a rule, removed continually in order to return it again in as fresh a condition as possible to the aeration basins.

The amount of electrical energy required to operate primary-settling-tank plants with sludge digestion is 0.6 kw-hr per capita or 4.7 kw-hr per mil gal of sewage treated. Without considering the population equivalent of industrial wastes, 1.3 man-hours per capita per year are required to operate small plants with sludge digestion when serving up to 5,000 persons and 0.3 man-hour per capita per year is required at large plants. If chemical precipitation is used these values increase to about 0.6 man-hours per capita per year when serving 3,000 to 30,000 persons. At primary-settling-tank plants with sludge digestion

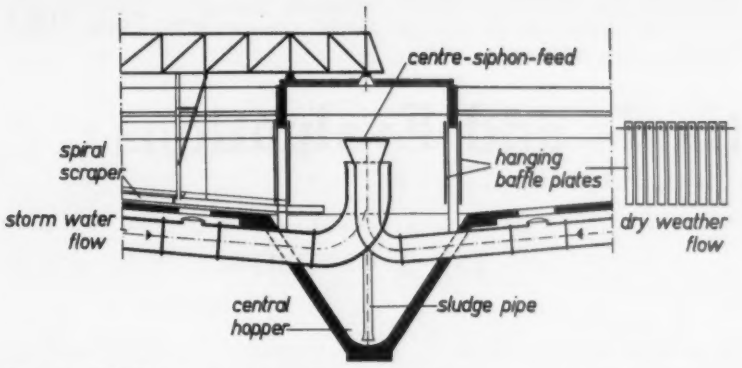


FIG. 5—CENTRAL portion of primary settling tank, Gevelsberg sewage-treatment plant, Ruhr District. Diameter: 116 ft. Dry weather and wet weather flow are conveyed separately to the middle of structure, around which stilling and distributing racks consist of double row of freely hanging metal plates, 6 x 1/6 in. Clogging of racks is prevented by this design.

4.6 man-hours per mil gal per year are required at medium size plants serving 3,000 to 30,000 persons.

Since only the settleable solids can be removed from the sewage in a plant provided with settling tanks, their performance is naturally limited. The efficiency lies in general between 25 and 35 per cent, when based on the removal of the biochemical oxygen demand. By means of the technical improvement in the shape of settling tanks and a more advantageous improvement in the construction of inlets and outlets, the performance and the efficiency, therefore, of settling tanks have been improved to a certain extent but not fundamentally so.

(To be continued)

How Fast Does Steel Rust In Your Community?

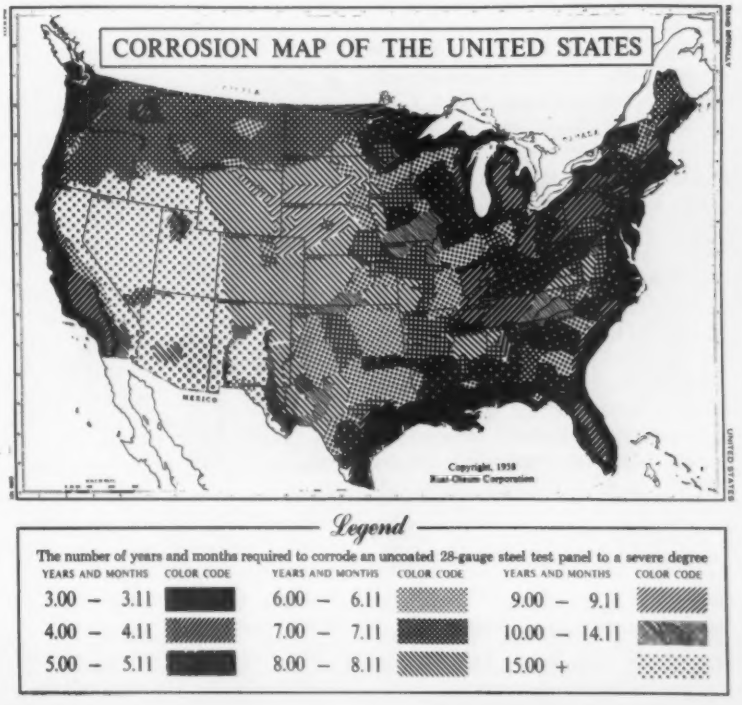
The comparative rates at which rust proceeds in different parts of the country, have been exactly established for the first time for all United States cities over 10,000 population.

It takes three years, the fastest rate in the country, for rust to corrode a standard, uncoated steel test panel, the size of an auto license plate, in four different cities — Buffalo and Rochester, N. Y.; Erie, Pa.; and Miami, Fla. The slowest rust rate, more than 15 years, is in Tuscon, Ariz.; Roswell and Santa Fe, N. M. In all the nation's major industrial centers the rust rate is under four years.

This information is available in the first Rust Index of the United States, published by the Rust-Oleum Corporation, Evanston, Ill. The Index, the result of a 25-year research program, lists the 523 cities of the country with a population of more than 10,000 and the comparative rust rate for each city. For example: the rust rate is three years, one month in Pittsburgh; three years, two months in Los Angeles; three years, three months in Cleveland; three years, five months in Chicago; three years, six months in New York City; three years, eight months in Philadelphia and Detroit; three years, nine months in San Francisco; and three years, 10 months in Boston and St. Louis.

The Index was compiled in a research program, in which dated and uncoated steel panels were left exposed at industrial sites throughout the country. The panels were of 28 gauge, low carbon, cold-rolled sheet steel. Thousands of panels were dated and left exposed by Rust-Oleum representatives during the past quarter of a century. Periodic examination of the panels provided the data for the Rust Index. The criterion for the Index was the time it took for the uncoated steel panel to rust to a severe degree.

Of the 523 cities listed, 221, or 42 per cent, were indexed as Class I, meaning that uncoated test panels there rusted in less than four years. Class I rust cities include every major industrial area and most of the nation's secondary industrial centers. In Class II, where test panels rusted in four to five years, are 95 cities. The 316 cities in Classes I and II comprise 60 per cent of the nation's cities with population over 10,000.



The 31st meeting heard reports and discussions on . . .

Education, Methods and Evaluations

a Meeting Report
by JAY S. GRUMBLING*, Assoc. Editor

EDITOR'S NOTE: The program for the meeting listed many reports on contemporary approaches and treatment methods. These ranged from evaluating such designs for the method in which they were intended, to what they are being used for and to what they might be used for. Trickling filters, the education of Sanitary Engineers, Municipal Government and automatic analytical methods were among the subjects probed in this manner. Abstracts of some of these papers are presented here.

■ EFFECT OF HIGH pH ON TRICKLING FILTER PERFORMANCE by C. Richard Walter, Hazen & Sawyer Engr., New York, N. Y.

Experiments were accomplished on a roughing filter operated with no prior settling. The hydraulic loading was varied from 18 to 36 MG/Acre/day and B.O.D. loadings varied from 2,000 to 12,000 lb/acre-ft/day. The filter, 4 ft diameter by 4.5 ft. deep, was preceded by a one quarter inch screen and a CO_2 tank for pH adjusting. The settling tank following the filter was removed from the system when results showed on a maximum only 10 percent additional B.O.D. removal was obtained from its use.

Wastes having pH values between 11 and 12 caused 25 percent efficiency drops. Wastes with a pH between 8 and 11 when applied would usually have a one point drop in the effluent.

In the operation of a roughing filter, a settling tank provides little additional B.O.D. removal when following the filter unit.

B.O.D. loadings in the range 3,000 to 6,000 lb/acre-ft/day at 2 to 1 recirculation produced 60 percent removal. Alkalinity increased in the influent caused a decrease in B.O.D. removals.

■ BIOLOGICAL TREATMENT OF INDUSTRIAL WASTES by Theodore L. Moore and J. T. Turcotte, Jr., Chief Sanitary Engineer and Sanitary Engineer respectively, Gibbs & Hill, Inc., Consulting Engineers, New York, N. Y.

The authors compiled a lengthy bound report on aerobic and anaerobic treatment methods applicable to processing industrial wastes. Aerobic methods were subdivided into fluid bed and fixed bed processes corresponding, for example, to activated sludge and biological filters.

Anaerobic methods were discussed according to design requirements such as heaters, temp. controls, large and small volumes, etc.

■ CONTEMPORARY APPROACH TO SANITARY ENGINEERING EDUCATION by Dr. Nelson Nemerow, Prof. of San. Engr., Syracuse Univ., Syracuse, N. Y.

The objective of any educational course is to stimulate the mind of the student. The pouring forth of categorized information in a spoon feeding technique is not considered educational. For this reason a professor must be better prepared for his short appearance before his students, also the student must be better prepared by having obtained a full understanding of the basic sciences.

The question is: Is the student to become a scientist or a technician, and if a technician, is such training justified at the present day $2,500 expense per student per year.

In U.S. Universities today, there are four general approaches in the sanitary engineering educational system:

Optional Plan—Where the undergraduate student obtains an introduction into sanitary engineering in his junior year and all sanitary engineering courses in his senior year. The graduate obtains a Bachelor of Science degree in Civil Engineering with a municipal or public health option. The option prepares the student for a definite purpose—a specialist, at the expense of other engineering subjects.

Modified Option Plan—Here the Civil Engineering program limits the number of electives, usually 4, which the student may choose. He, therefore, doesn't have the opportunity to take as many specific courses in sanitary engineering as desired.

Broad Engineering Program—For the first three years, the student must take straight engineering subjects only. Only in the senior year is he allowed to elect sanitary engineering subjects. This approach provides the basic knowledge, so the student can work with his hands. He can see the broad spectrum.

Cooperatives—The student divides his time between industry and formal study. He receives the practical application of the knowledge obtained through formal study. Here the short periods of employment in industry are not always acceptable or desirable to that industry.

The Broad Engineering Program is preferred by the writer. In undergraduate study the specialized courses should be kept to a minimum. Specialization should be provided at the graduate level. In this manner the engineer has the basic engineering knowledge which when augmented with sanitary chemistry and bacteri-

*Now Research Chemist Metcalf & Eddy.

ology obtained through graduate school attendance, produces a scientist and not a technician.

■ DEVELOPMENTS IN MUNICIPAL GOVERNMENT by Dr. Stephen B. Sweeney, Dir. of Institute of Local and State Government, Univ. of Penna., Philadelphia, Pa. (A luncheon address)

This nation needs more leaders in the field of municipal and local government. Leaders who can serve as consultants and thereby devoice themselves from political restraints.

The technological revolution and the continuing population growth has demanded Big Government. The Federal budget is now 150 times the size of the 1900 budget. The fiscal affairs of Big Government have imposed difficulties on a municipality's ability to obtain funds. At the same time, increase in the number of automobiles on the highways, the movies, the dissemination of information through publications and the mass leisure has enabled people to look around and focus attention on public affairs. The demands of these people can not be met on the local level within political boundaries. They are required to turn to the State or Federal Government for assistance. Local and city governments can no longer compete on their own level.

The rural population in this nation has increased 60 percent since 1900. These sprawling communities have taken little concern for political boundaries. Central cities are deteriorating faster than they can be renewed. They are not able to compete for the tax dollar and therefore must turn to the Federal or State government for assistance.

The municipality's difficulty in overcoming physical boundaries is difficult enough, but the social and political are worse. The establishment of metropolitan districts is a partial answer. Such districts will double in number by 1980 but this must be accomplished by specialists. The art of city management is becoming a specialty. Such specialists are required to find solutions to the major problems affecting local governments and these problems must be accepted as being inter-governmental. Solutions will require both horizontal and vertical coordination among governing bodies to obtain inter-relation and agreement.

Development of utility service is a very good example of a problem facing local governments. It is too expensive and most often a duplication of physical outlay for adjacent communities to develop autonomous services.

■ INTERIOR SEWER PHOTOGRAPHY by Mrs. William Ulrich, Sub-Surface Photo Co., Venice, Calif. (A tape recorded presentation with slides)

That which is under the ground can be inspected by photography. The methods and equipment used to obtain pictures within sewer interiors involves mounting cameras with flash attachments on floats with wheeled attachments and pulling or floating the apparatus through measured pipe distances.

■ CONTINUOUS AUTOMATIC QUANTITATIVE SEWAGE AND WASTES ANALYSES by Andres Ferrari, Dir., Research Laboratories, Technicon Co., Chauncey, N. Y.

A monitor is available to maintain continuous analysis of a waste stream and feed back signals to control equipment.

The monitor is an arrangement of equipment beginning with a sampler or piping in the case of continuous sampling, a proportioning pump, a dializing system to aliquant a specimen and a reagent vessel where the specimen and reagent are mixed and treated, a colorimetric and a recorder.

Depending on the use for the equipment, other heating or deoxygenating apparatus may be incorporated to speed reaction time or remove interfering substances. Today, dializer membranes are available which are immune to the adverse effects of oils and other hydrocarbons, acids, alkalies, etc. The equipment is applicable to determining the concentration of a component in waste which is capable of being analyzed by photometric methods.

■ EVALUATION OF MILK WASTE TREATMENT PROCESSES IN NEW YORK STATE by William T. Ingram, Adjunct Professor and Gerald Palevsky, Adjunct Asst. Professor, New York University, N. Y.

A host of methods are applied to the treatment of milk wastes in the state. Among them are batch and continuous high rate oxidation with recirculation and about 14 hour aeration periods; the same approach using high rate trickling filters with about 25 passes for batch treatment; and lagoons with or without aeration or limited recirculation. Batch processes with recirculation required or had available holding tanks with up to 32,000 gal. capacity.

Odor and nuisance problems associated with these installations were due to overloading the units because of excessive spills, lack of pH control, temperature rises and solids carryover in the case of lagoons.

■ AN INVESTIGATION OF THE MECHANISMS OF CONTROLLED FILTRATION by William E. Ingram, Adjunct Professor, New York University, N. Y.

In the effort to duplicate the conditions which occur naturally in stream recovery, a trickling filter of six sections was constructed. Each section is one foot in diameter and three feet deep. The unit is so constructed that sampling may be accomplished at the bottom of each of the top three sections.

In the beginning the filter media was one-half inch plastic pellets. This was substituted with one-quarter inch rock which also was removed in favor of 1.5 inch rock. Due to the height of the unit ventilation could be accomplished by forcing air up from the bottom of the unit. Experiments may be conducted by varying the organic and hydraulic loadings, also the temperature if desired and varying the filter depth.

Hydraulic loadings have been applied at 3,680 gal/day/sq.ft and organic loadings at 230 lbs BOD/day/1000 cu ft or higher. Overall efficiency at these high loadings has been as high as 98 percent.

Studies have indicated some support to the theory that increased depth causes increased BOD removal and efficiency. The top sections of the filter accomplish removal mainly by adsorption. Here the growth make-up is primarily zoogleal. Free swimming ciliates are present in all sections of the filter. There is an apparent relation to large populations of stalked ciliates and an increase in removal. There is an increase in nitrification in the bottom sections of the filter. Filter sloughing averages 2 to 5 mg/L by Imhoff cone when flow remains continuous.

The Editor's Comments

An Era Approaches an End

Elsewhere in this issue, there is a report on the actions of the AWWA Board at its recent annual meeting. One of the significant actions at that meeting was the acceptance of Harry Jordan's retirement as Secretary of the American Water Works Assn., effective Sept. 1, 1959.

Harry E. Jordan, "Mr. Water Works" to all of us in the field of water supply and sewage disposal, will leave his post as Secretary after 23 years in that position. He was the first full time secretary of the Association. Under his stewardship, membership in the Assocation grew from 3000 to more than 12,000, at an average rate of approximately 400 new members a year.

With that growth in membership, the Association grew in stature in many ways; in active committees, in standards for equipment, in service to the industry, in service to its members, and in service to the public.

Only three years ago, when AWWA reached its 75th anniversary, this magazine editorialized on "AWWA's Stairway to the Stars". From that editorial, written by the late Linn Enslow, we quote: " . . . to hear the volume of productive AWWA Committee work currently in progress; to see the expansion of headquarters office activities and staff; is to realize the directive acumen and ability at getting things done that is possessed by Secretary Harry E. Jordan, . . . A look at the membership growth chart from 1937 forward is in itself ample evidence of the increasing value and usefulness of AWWA to the water works profession. Comparing the growth curve before 1937 and since, we contend is proof enough that 'formula HEJ' has proven mighty 'good medicine' for AWWA."

Among the many advances that have taken place in the past 23 years, are the continuing efforts to establish standards for the industry, and the publication of such standard reference material as the "Manual of Water Works Accounting", the Manual of Water Quality and Treatment", and the continued excellence of the Journal of AWWA.

As Mr. Jordan leaves his office, he can look back over these and many other accomplishments as well as two new projects, started under his stewardship, but left to the completion of those who follow him. These are the program on "Operation Water Works Advancement" into which Jim Corey is pouring tremendous amounts of energy and ideas; and the Certification Program, which is being handled by a committee headed by L. S. Finch, current president of the Association.

While Mr. Jordan will retire from the active job of Secretary of AWWA he will not put away his interest in the industry or the activities of the Association. In fact, he expects to spend his time at his home in Port Washington, L. I., writing a "History of the American Water Works Association." This project itself should occupy his efforts for some time, and when completed, should take its place alongside Baker's "The Quest for Pure Water".

During the course of Mr. Jordan's professional life, (56 years to date) he has garnered many honors and accolades, not because he sought them, but because he earned them through his own industrious efforts. He is a past president and honorary member of AWWA; he has had one of AWWA's highest honors named for him, "The Harry E. Jordan Achievement Award". Mr. Jordan was awarded an honorary Doctor of Science degree by his alma mater, Franklin (Ind.) College; he is an honorary member of the Institution of Water Engineers of Great Britian, an honorary member of the New England Water Works Assn., a Fellow (life) of the Amer. Pub. Health Assn.; a life member of the Amer. Chem. Soc.; and a life affiliate member of the Amer. Soc. of Civ. Engrs.

Mr. Jordan's departure from the office of AWWA is truly the end of an era, but he leaves the administration and operation of the Association in good hands. The Board has appointed Raymond J. Faust to succeed Mr. Jordan as secretary and chief administrative officer. Ray Faust has been Executive Asst. Secretary of AWWA since 1951, in which position he has understudied Mr. Jordan. Prior to coming to AWWA, Mr. Faust was chief of the water supply section of the Michigan State Department of Health. He had worked in the Michigan Dept. of Health for 28 years following his graduation as a sanitary engineer from Penn State University. He is a registered engineer in Michigan and New York and a member of the ASCE, APHA and is a Diplomate in the American Academy of Sanitary Engineers. We wish him success in his new duties which he will assume next September.

George E. Symons.

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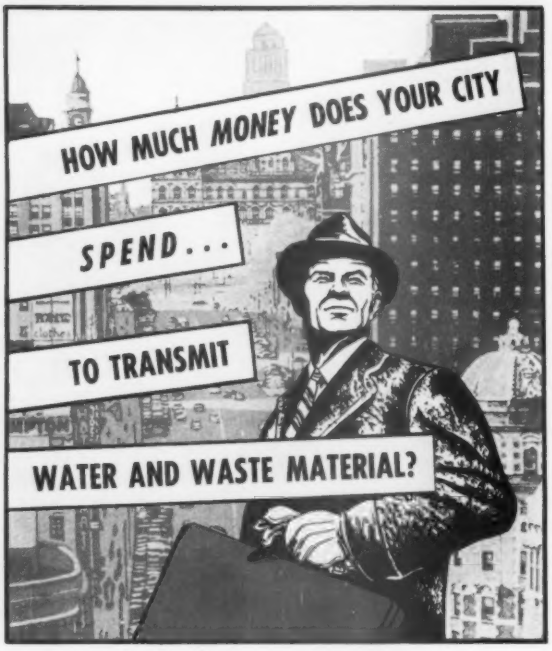

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Meetings

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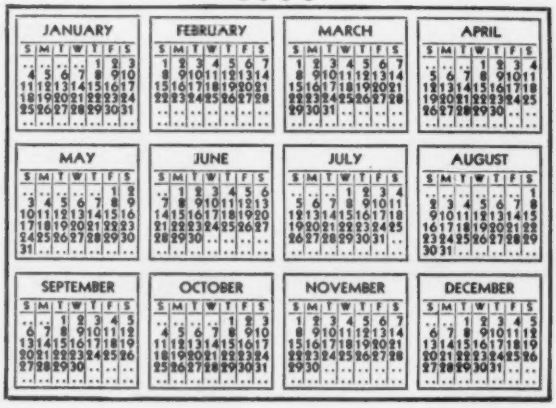


Apr. 2-3—Chapel Hill, N. C. (*Univ. of North Carolina*)
EIGHTH SOUTHERN MUNICIPAL & IND. WASTE CONF., Prof. Dan A. Okun, Univ. of North Carolina, Chapel Hill, N. C.

Apr. 2-3—Seattle, Wash. (*Univ. of Washington*)
9TH PACIFIC NORTHWEST INDUSTRIAL WASTE CONFERENCE, Prof. Robert O. Sylvester, Dept. of Civ. Engrg., Univ. of Washington, Seattle 5, Wash.

Apr. 5-8—Columbia, S. C. (*Wade-Hampton Hotel*)
SOUTHEASTERN SECTION, A.W.W.A., Secy., N. M. de Jarnette, State Dept. of Public Health, 309 State Office Bldg., Atlanta 3, Ga.

Apr. 5-10—Cleveland, Ohio (*Public Auditorium*)
5TH NUCLEAR CONGRESS sponsored by AWWA and other Societies, T. A. Marshall, Jr., Mgr., 1959 Nuclear Congress, c/o Engineers Joint Council, 29 W. 39th St., New York 18, N. Y.

Apr. 5-10—Boston, Mass.
135TH NATIONAL MEETING AMERICAN CHEMICAL SOCIETY, Secy., H. B. Gustafson, P. O. Box 5033, Tucson, Ariz.

Apr. 6-8—Pullman, Wash. (*State College of Washington*)
SIXTH BIENNIAL INLAND EMPIRE SEWAGE WORKS SHORT SCHOOL, Prof. G. H. Dunstan, State College of Washington, Pullman, Wash.

Apr. 8-10—Rochester, N. Y. (*Powers Hotel*)
N. Y. SECTION, A.W.W.A., Secy., Kimball Blanchard, 19 W. 50th St., New York 20, N. Y.

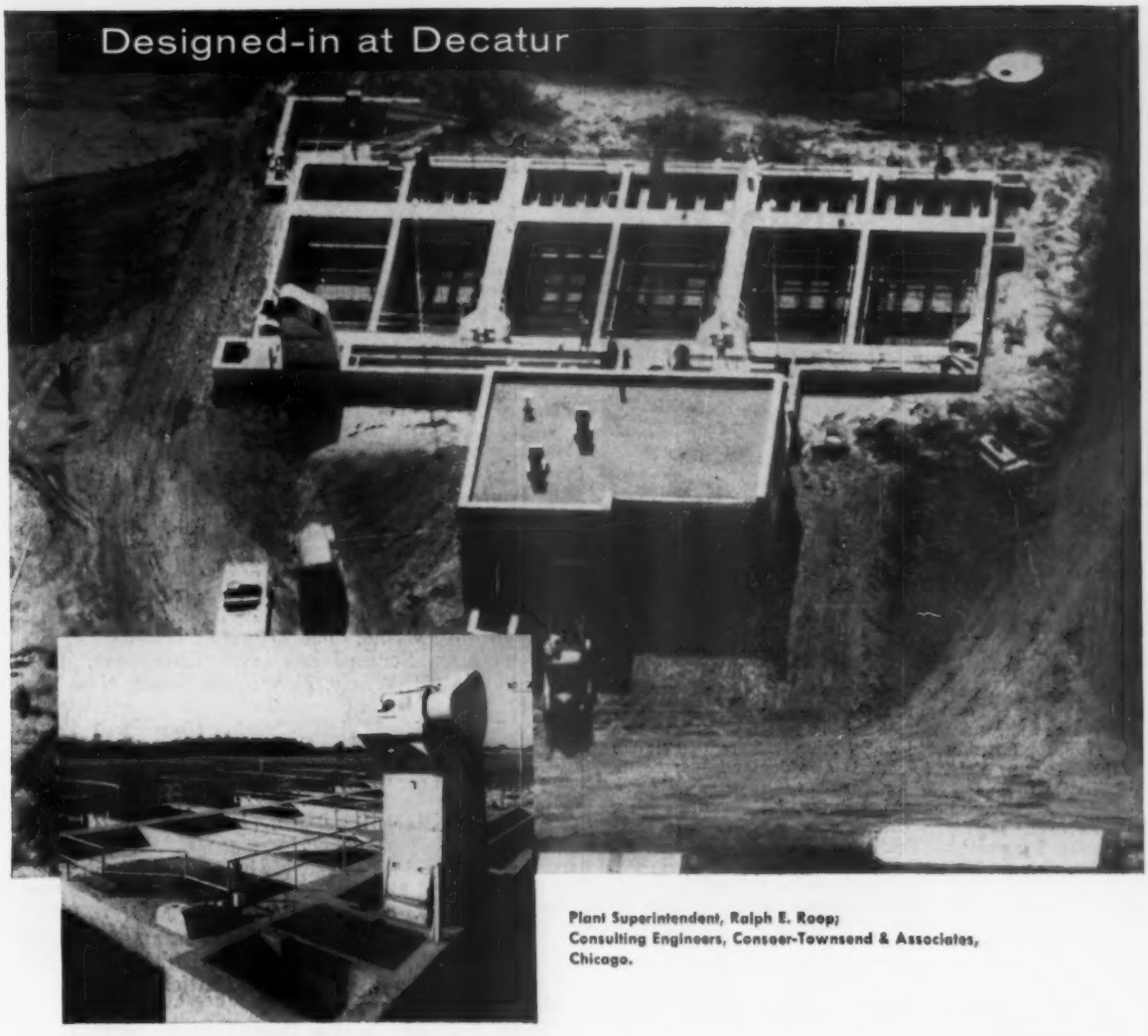
Apr. 9—Bangor, Maine
MAINE WATER UTILITIES ASSN., Secy., G. F. Laurin, 89 Western Ave., Augusta, Maine

Apr. 9-11—Glendive, Mont. (*Jordan Hotel*)
MONTANA SECTION, A.W.W.A., AND MONTANA SEWAGE & INDUSTRIAL WASTES ASSN., Joint Meeting, Secy., Arthur W. Clarkson, State Board of Health, Helena, Mont.

Apr. 13-14—Luray, Va. (*The Mimslyn*)
VIRGINIA INDUSTRIAL WASTES & SEWAGE WORKS ASSN., Secy., O. J. Hand, c/o Hercules Powder Co., Hopewell, Va.

Apr. 15-17—Lincoln, Neb. (*Cornhusker Hotel*)
NEBRASKA SECTION, A.W.W.A., Secy., Rupert C. Ott, Jr., Neptune Meter Co., 2818 - 21st St., Columbus, Nebr.

CONTINUED ON PAGE 92A



Plant Superintendent, Ralph E. Roop;
Consulting Engineers, Consoer-Townsend & Associates, Chicago.

Maximum efficiency in minimum space

The new Decatur, Indiana, trickling filter sewage treatment plant clearly illustrates how careful planning can produce a plant that is a model of compactness, neat arrangement and efficient operation. Rectangular channels and tanks were arranged so as to permit maximum use of common walls for compactness and greatest construction economies.

As the illustrations show, grit channels...primary tanks...final tanks...reaeration tanks...and chlorination tank are all neatly grouped, with common walls providing maximum efficiency in minimum space. The tanks are so arranged that expansion of facilities can be easily accomplished.

To translate compactness into efficient performance, CHAIN Belt modern waste treatment equipment was selected for both primary and final treatment stages. A Rex Chain and Bucket Type Grit Collector, installed in a 2′6″ wide x 42′6″ long x 4′ deep channel, provides effective removal of inorganic solids. A channel for future expansion was also constructed (see inset).

Rex Type ME Conveyor Sludge Collectors are installed in both the primary and secondary settling basins. Lever-operated Rex Roto-Skim skimming pipes are used to remove accumulated surface scum in the primary tanks. Common walls divide the three primary tanks, which are 16′6″ wide x 50′ long x 8′ average water depth, and the three final tanks, which are 14′6″ wide x 50′ long x 7′6″ average water depth.

For most efficient operation...for most effective results, why not put the CHAIN Belt team to work for you. For information on the complete Rex line, write CHAIN Belt Company, 4610 W. Greenfield Ave., Milwaukee 1, Wis.

REX®

CHAIN BELT COMPANY

PLEASE NOTE THE EMPHASIS

PROFITABLE SEWAGE SLUDGE DISPOSAL

There is no longer any question that the disposal of sewage sludge can be a PROFITable operation. Enough bonafide studies of municipalities that are profiting from the sale of sludge are on record to prove this without a doubt. *The sale of sewage sludge can be an additional source of municipal income.*

The question is now, "How can we *increase* the profit from the sale of sewage sludge?"

Here are several ideas. First, if you now sell sludge cake in lump form, consider shredding it. Shredded sludge is easier to use, easier to sell. It also demands—and gets—a better price.

Second, if you sell shredded sludge, but process with a hand-shovel fed Royer, consider changing to a tractor-bucket fed operation. You'll increase production, have more salable sludge and cut operating costs.

Your clue to more PROFITable sludge disposal is shredding and selling. Only Royer offers a complete range of sizes in portable and stationary model belt shredders to fit any size operation.

If your operation is *not* selling sludge, write for a copy of the Sewage Sludge Utilization Datalog and get the facts. If you are selling sludge, and want to up your profits, write for our new Bulletin S-59, Royer Shredders for Mechanically Fed Operations.

Please rush me copies of

☐ Sewage Sludge Utilization Datalog

☐ Bulletin S-59, Royer Shredders for Mechanically Fed Operations

☐ Bulletin, Royer Shredders for Processing Sewage Sludge

Name_____ Title_____

Plant_____

City_____ Zone_____ State_____

ROYER FOUNDRY & MACHINE CO.

ROYER

170 PRINGLE STREET

KINGSTON, PENNA.

Apr. 16-17—Springfield, Ill. (*Leland Hotel*)
ILLINOIS SEWAGE WORKS OPERATORS' CONFERENCE, Tech. Secy., C. W. Klassen, Room 616, State Office Bldg., Springfield, Ill.

Apr. 16-18—Phoenix, Ariz. (*Hi-Way House Hotel*)
ARIZONA SECTION, A.W.W.A., Secy., Stanford I. Roth, Div. of Water & Sewers, Phoenix, Ariz.

Apr. 22-24—Pittsburgh, Kansas (*Besse Hotel*)
KANSAS SECTION, A.W.W.A., Secy., Harry W. Badley, Neptune Meter Co., 119 West Cloud, Salina, Kan.
(Jointly With)
KANSAS SEWAGE & INDUSTRIAL WASTES ASSN., Secy., James F. Aiken, Jr., 1900 East Ninth, Wichita, Kan.

Apr. 23-25—Vancouver, B. C. (*Vancouver Hotel*)
PACIFIC NORTHWEST SECTION, A.W.W.A., Secy., Fred D. Jones, W. 2108 Maxwell Ave., Spokane 11, Wash.

Apr. 24—Reading, Pa. (*Abraham-Lincoln Hotel*)
PENNA CLEAN STREAMS CONFERENCE sponsored by Pa. State Chamber of Commerce.

Apr. 29-May 2—Long Beach, Calif. (*Hotel LaFayette*)
CALIFORNIA SEWAGE & INDUSTRIAL WASTES ASSN., Secy., Alfred Leipzig, 12000 Vista Del Mar, Venice, Calif.

May 3-6—Montreal, Can. (*Queen Elizabeth Hotel*)
CANADIAN SECTION, A.W.W.A., Secy., Dr. A. E. Berry, 72 Grenville St., Toronto, Ont. Can.

May 4-8—Cleveland, Ohio (*Hotel Cleveland*)
AMERICAN SOCIETY OF CIVIL ENGINEERS, Exec. Secy., W. H. Wisely, 33 W. 39th Street, New York 18, N. Y.

May 5-7—Lafayette, Ind. (*Purdue University*)
14TH PURDUE INDUSTRIAL WASTE CONF., Chairman, Prof. Don E. Bloodgood, Purdue University, Lafayette, Ind.

May 11-13—Bay City, Mich. (*Wenonah Hotel*)
MICHIGAN SEWAGE & INDUSTRIAL WASTES ASSN., Secy., Donald M. Pierce, Mich. Dept. of Health, Lansing 4, Mich.

May 13-14—Durham, N. H. (*Univ. of N. H.*)
NEW ENGLAND SEWAGE & INDUSTRIAL WASTES ASSN., Spring Meeting, Secy., Earl R. Howard, Bur. of Pub. Works, 115 Broad St., Hartford, Conn.

May 21—Manchester, N. H.
NEW ENGLAND WATER WORKS ASSN., Secy., Joseph C. Knox, 73 Tremont St., Boston, Mass.

June—Berkeley, Calif. (*Univ. of Calif.*)
FIRST INTERNATIONAL CONF. ON WASTE DISPOSAL IN MARINE ENVIRONMENT, Prof. Erman A. Pearson, San. Engr., Research Laboratory, Univ. of Calif., Berkeley 4, Calif.

June 3-5—Wernersville, Pa. (*Salem House*)
PENNSYLVANIA SECTION, A.W.W.A., Secy., L. S. Morgan, Chief, Mine Drainage Sec., 413 First National Bank Bldg., Greensburg, Pa.

June 4-6—Tuscaloosa, Ala. (*Univ. of Alabama*)
ALABAMA WATER & SEWAGE ASSN., *Secy.*, E. J. Finnell, Jr., University of Alabama, University, Ala.

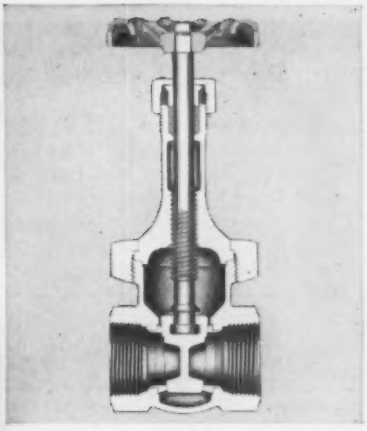
June 11—York, Maine
MAINE WATER UTILITIES ASSN., Secy., G. F. Laurin, 89 Western Ave., Augusta, Maine

June 14-17—Honey Harbour, Ont. (*Delawana Inn*)
6TH INDUSTRIAL WASTE CONF., Secy., D. S. Caverly, Ontario Water Resources Comm., East Block Parliament Bldg., Toronto, Can.

June 17-19—Cincinnati, Ohio (*Netherland Hilton Hotel*)
OHIO SEWAGE & INDUSTRIAL WASTES TREATMENT CONF., Secy., Cleamon E. Lay, Ohio Dept. of Health, 101 North High St., Columbus 15, Ohio

CONTINUED ON PAGE 94A

Expanded-type body rings. Made from Crane Exelloy—a 12% chromium stainless steel. Provide a hard surface that resists abrasive damage, indentation and scoring by foreign matter. Rings are rolled in, can't work loose. Seating wear is taken by easy-to-replace bronze disc.



Quality in every detail inside and out. In rising and non-rising stem patterns—¼ to 3 inches—screwed ends. Working pressures: 200 lb. steam, 550° F.; 400 lb. non-shock cold water, oil, gas and air, 150° F.

Cylindrical body shape. Proved on high-pressure steel valves. Increases body strength without adding bulk. Distributes pressure uniformly. Reinforces seating area against distortion and chance for leaks.

12% chromium stainless steel seat rings make Crane 200-pound bronze gates last longer

Here is a close-up of Crane quality that shows you why these 200-pound bronze gate valves perform more dependably than ordinary bronze valves, with less maintenance.

For example, instead of integrally cast seats, they have long-wearing 12% chromium stainless steel body rings. Rings are rolled in... can't work loose in service. This also prevents leakage around rings. The quickly replaceable bronze disc takes normal seating wear.

Crane 200-pound bronze valves are competitively priced with bronze valves which do not have these and other important features. Why pay for less than Crane offers you? For complete facts, see your Crane Representative.

Write for Circular AD-2285. Gives complete technical data on both rising and non-rising stem patterns.

CRANE® VALVES & FITTINGS

PIPE • PLUMBING • HEATING • AIR CONDITIONING

Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas

June 17-19—Cedar Rapids, Iowa (*Roosevelt Hotel*)
IOWA SEWAGE & INDUSTRIAL WASTES ASSN., Secy., L. F. Skorczeski, 207 South 15th Ave., Marshalltown, Iowa.

June 18—Wentworth, N. H.
NEW ENGLAND WATER WORKS ASSN., Secy., Joseph C. Knox, 73 Tremont St., Boston, Mass.

June 24-26—Minneapolis, Minn. (*Pick Nicollet Hotel*)
CENTRAL STATES SEWAGE & INDUSTRIAL WATES ASSN., Secy., Scott A. Linsley, P. O. Box 3598, Child Rd., St. Paul Minn.

July 12-17—San Francisco, Calif (*Civic Auditorium*)
A.W.W.A., CONVENTION, Secy., Harry E. Jordan, A.W.W.A., 2 Park Ave., New York 16, N. Y.

July 12-17—San Francisco, Calif., (*Civic Auditorium*)
CALIFORNIA SECTION, A.W.W.A., In Conjunction with National Convention, Secy., Roy E. Dodson, Jr., San Diego Water Dept., Balboa Park, San Diego 1, Calif.

Aug. 12-14—University Park, Pa. (*Pa. State University*)
PENNSYLVANIA SEWAGE & INDUSTRIAL WASTES ASSN., Secy., J. R. Harvey, 996 S. Main Street, Meadville, Pa.

Aug. 13—Vinal Haven, Maine
MAINE WATER UTILITIES ASSN., Secy., G. F. Laurin, 89 Western Ave., Augusta, Maine

Sept. 2-4—Huron, So. Dak. (*Marvin-Hughitt Hotel*)
SOUTH DAKOTA WATER & SEWAGE WORKS CONF., Secy., Don C. Kalda, Pierre, So. Dak.

Sept. 7-9—Jackson, Wyoming (*Jackson Lodge*)
ROCKY MOUNTAIN SEWAGE & INDUSTRIAL WASTES ASSN., Secy., Verne E. Plath, P. O. Box 149, Englewood, Colo.

Sept. 9-11—Milwaukee, Wis. (*Hotel Schroeder*)
WISCONSIN SECTION, A.W.W.A., Secy., Harry Breimeister, City Engrs. Office, City Hall, Milwaukee 2, Wis.

Sept. 13-18—Atlantic City, N. J.
136TH NATIONAL MEETING AMERICAN CHEMICAL SOCIETY, Secy., H. B. Gustafson, P. O. Box 5033, Tucson, Ariz.

Sept. 14-16—Lexington, Ky. (*Lafayette Hotel*)
KENTUCKY-TENNESSEE SECTION, A.W.W.A., Secy., J. Wiley Finney, Jr., Howard K. Bell, Cons. Engrs., 553 South Limestone St., Lexington, Ky.
(Jointly With)
KENTUCKY-TENNESSEE INDUSTRIAL WASTES & SEWAGE WORKS ASSN., Secy., S. Leary Jones, Cordell Hull Bldg., Nashville, Tenn.

Sept. 16-18—Upper Saranac Lake, N. Y. (*Sarnac Inn*)
NEW YORK SECTION, A.W.W.A., Secy., Kimball Blanchard, 19 W. 50th Street, New York 20, N. Y.

Sept. 20-23—Lake Placid, N. Y. (*Lake Placid Club*)
NEW ENGLAND WATER WORKS ASSN., Secy., Joseph C. Knox, N.E.W.W.A., 73 Tremont St., Boston 8, Mass.

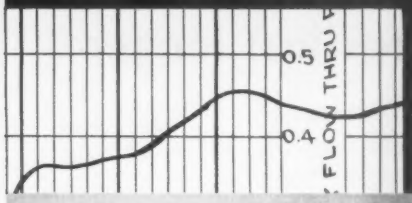
Sept. 23-25—Saginaw, Mich. (*Bancroft Hotel*)
MICHIGAN SECTION, A.W.W.A., Secy., T. L. Vander Velde, State Dept. of Health, DeWitt Road, Lansing 4, Mich.

Sept. 27-29—Kansas City, Mo. (*Hotel President*)
MISSOURI SECTION, A.W.W.A., Secy., Warren A. Kramer, Div. of Health, State Office Bldg., Jefferson City, Mo.

NOW
LOW-COST AUTOMATIC FLOW RECORDING

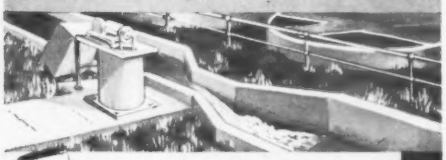
Directly Readable Flow Charts

Obtain graphic records of liquid flow directly readable in million gallons per day or gallons per minute over various sizes of Parshall flumes. The same recorder can also be used with charts reading in feet and hundredths to record head or surface fluctuations in lakes, streams, wells. Write for free Bulletin 24.



STEVENS
TYPE F RECORDER

...For Measuring Sewage, Industrial Waste and Other Flows



The planning and efficient operation of any project which involves measurements of flowing liquids is based on flow data which can be obtained with STEVENS Recorders. These instruments are at work compiling data on hydroelectric and flood control projects and in water works, sewage disposal plants, irrigation and industrial installations in all parts of the world.

Experienced technical staff available to supply product information for liquid measurement installations. Write, giving description of project and scope of data desired.

HYDROGRAPHIC DATA BOOK
invaluable for your reference file
124 pages of technical data on recorder installations, plus a wealth of hydraulic tables and conversion tables. $1 copy. (No COD's.)

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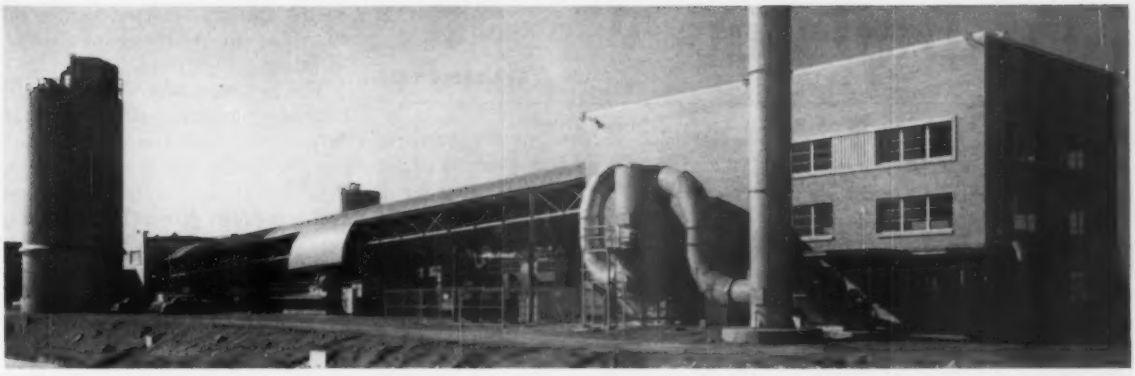
4445 N. E. GLISAN STREET • PORTLAND 13, OREGON
specialists in hydrologic instruments for over half a century



Up to 150 tons of lime a day can be recovered by Dayton's Lime Recalcining Plant. City expects to get its $1,330,000 plant investment back in 20 years — plus a surplus estimated in the millions. *Consulting Engineers: Black & Associates, Gainesville, Florida.*

at City of Dayton –

self-amortizing lime recovery plant designed around Magnetic Flow Meters

Dayton, Ohio's million dollar lime recalcining plant would warm the cockles of the thriftiest Scotsman's heart. Designed to recover lime used in softening city water, the plant actually recovers up to 20% more lime than originally added, with additional capacity to process most of the lime sludge accumulated over the last 5 years! City plans to sell the overage — recover its investment in short order.

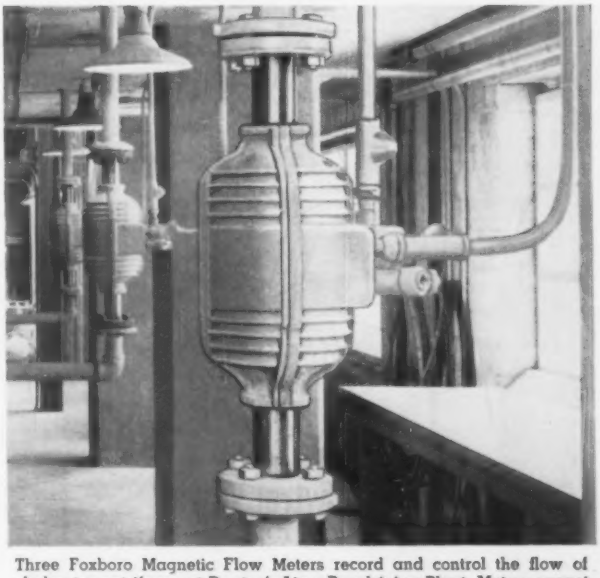
Dayton's Lime Recalcining Plant was designed around Foxboro Magnetic Flow Meters. Sludge, which would foul-up conventional head-loss devices, is easily measured since these unique meters have no flow restrictions. Measurement is instantaneous—continuous—linear. Rate of flow to centrifuges can be controlled exactly.

Maintenance on the Magnetic Flow Meter is practically nil. There are no pressure taps to get plugged or frozen . . . no seals or purges . . . no moving parts to foul.

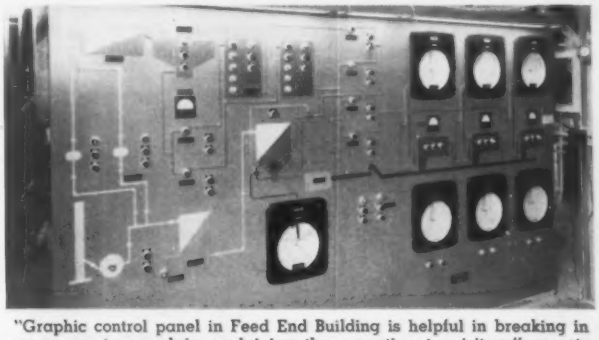
For practically *any* liquid, however "difficult", you'll find the Foxboro Magnetic Flow Meter a sound investment. Find out about this fabulous instrument today. Ask your Foxboro Field Engineer for details, or write for Bulletin 20-14C. **The Foxboro Company, 894 Neponset Avenue, Foxboro, Massachusetts.**

FOXBORO
REG. U.S. PAT. OFF.

MAGNETIC FLOW METERS



Three Foxboro Magnetic Flow Meters record and control the flow of sludge to centrifuges at Dayton's Lime Recalcining Plant. Meters cannot plug up because they have no flow restrictions.



"Graphic control panel in Feed End Building is helpful in breaking in new operators and in explaining the operation to visitors," reports Plant Supt. Robert C. Stout.

New Bulletins

AVAILABLE FREE

Flotators

414

Process Engineers, Inc., Div. of The Eimco Corp., has just released an 8-page two-color brochure describing the Eimco-Process Flotators and auxiliary equipment.

Liberally illustrated with flowsheets, schematics and photographs, the bulletin describes the basic circular type mechanisms and some of the design variations employed to meet special requirements in oil and grease recovery, meat packing waste treatment and other applications. A pilot plant Flotator is also described.

Sequoil Tubeline

415

Western Pump Company, San Jose, Calif., has just released a brochure on the history of "Sequoil Tubeline".

The brochure tells the story of the company's continuous research and development activities aimed at solving the problem of reducing wear from the "whip" of continuous steel shafts used to power high-speed tubine pumps.

In the course of their research, the company found that redwood, in its natural state has the qualities of medium weight, low shrinkage, ease of working and high resistance to decay that combine to make it the ideal material for tubelining.

The brochure contains letters telling about "Sequoil Tubeline" from users all over the world wherever pumping conditions are difficult.

Watertight Concrete

416

The Master Builders Co., Cleveland, Ohio, has available a 6 page folder giving a factual summary of authoritative thought on the Design and Specification of Watertight Concrete.

Discussion covers the basic requirements for watertight concrete and how Pozzolith reduces permeability, shrinkage, bleeding and segregation to produce strong, durable structural concrete that is highly resistant to the penetration of water under normal conditions.

Adjustable Pump Operating Data

417

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has available a new bulletin that presents comprehensive operating data on the ACAP pump for handling liquids or hygroscopic solids in suspension under variable capacity and head requirements.

According to the buletin, the ACAP pump's precision variable flow control is handled by a manually or automatically operated adjustable internal bypass mechanism which eliminates the need for a valve controlled discharge where solids can build up an obstruction.

Varying bypass clearance is provided for and vigorous mixing action of recirculation tends to prevent accumulation of air at the point of low

CONTINUED ON PAGE 98A

ONE MAN CONTROL

G-A *Cushioned* Flowtrol Valve

It's easier to operate a G-A Flowtrol Valve than it is to drive a car with power steering! The reason? Line pressure furnishes the power to open or close the valve. No manual effort, no handwheels, no motors, no levers are needed —regardless of size of valve or pressure. Just a "flick of the wrist" or press of a button will fully open or tightly close the valve.

Get all the facts in Bulletins W-8A and G-4.

Golden Anderson Valve Specialty Company

1210 RIDGE AVENUE, PITTSBURGH 33, PA.

Designers and Manufacturers of VALVES FOR AUTOMATION

Rivers to Cross?

Specify America's Finest Flexible Joint

American Molox
Ball Joint Cast Iron Pipe

Get the strength, proven long life and trouble-free service of American Cast Iron Pipe — plus the special advantages of a flexible joint *designed* for river crossings — with American Molox.

Premium quality, American Molox is designed with an integrally cast socket and cast steel glands for maximum strength and large diameter stainless steel bolting for corrosion resistance.

For full information about this *service-proven* pipe, call your American Cast Iron Pipe Company representative, or write for the descriptive brochure "American Molox Ball Joint Pipe."

AMERICAN
CAST IRON PIPE CO.
BIRMINGHAM ALABAMA

SALES OFFICES
New York City • Dallas
Chicago • Kansas City
San Francisco • Denver
Pittsburgh • Orlando
Minneapolis • Cleveland
Birmingham

New Bulletins

CONTINUED FROM PAGE 96A

pressure, thereby eliminating expensive shut downs. Any point of operation can be obtained between the head-capacity characteristic limits of the pump bypass, fully closed or fully opened.

Power requirements of the ACAP pump as compared to a standard pump with valve controlled discharge are plotted in the bulletin which includes range and power savings charts for the unit.

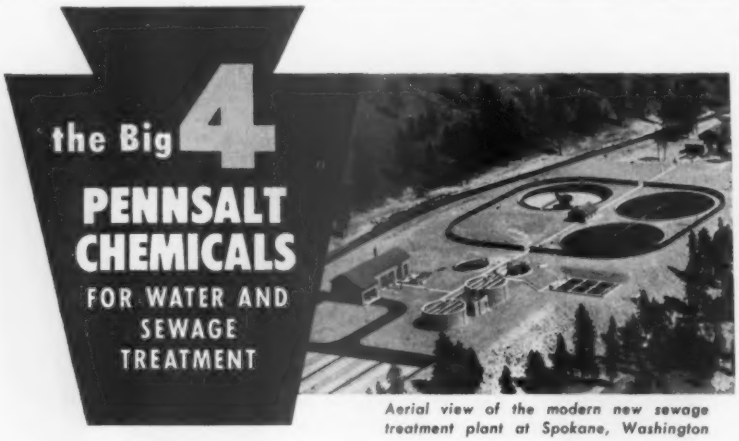
Selective Gas Measuring Instrument

418

Mine Safety Appliances Co., Pittsburgh, Pa., has available a new bulletin that describes a newly improved process control instrument for continuous measurement of the concentration of one gas in multi-component mixtures.

The new bulletin describes the M-S-A Gas Thermatron and explains its selective measurement of one component in a complex sample stream through use of two different types of cells that have identical filaments.

Applications to a variety of gas analysis problems are suggested. These include measurement of ethylene oxide in a mixture of carbon dioxide and air and carbon dioxide or hydrogen in mixtures of hydrogen, carbon dioxide, and air; measurement of hydrogen in furnance atmospheres, measurement of hydrogen carbon monoxide, and methane in mixtures of these three gases with air or nitrogen, and measurement of carbon dioxide in flue or exhaust gases for combustion control.



Aerial view of the modern new sewage treatment plant at Spokane, Washington

CHLORINE. A uniform quality waterworks grade of chlorine. Used by hundreds of cities and communities throughout the country because of confidence in PENNSALT'S Quality Control of the product. Shipped in 100 and 150 lb. cylinders and ton containers by rail, truck and water.

AMMONIA, Anhydrous. Waterworks grade, shipped in modern, lightweight cylinders which saves considerable freight cost and lightens the burden of handling. 50, 100, 150 lb. cylinders.

PERCHLORON. High-test calcium hypochlorite containing 70% available chlorine. Shipped in 100 lb. drums; cases—nine 5-lb. cans to a case.

FERRIC CHLORIDE, Anhydrous. Use of PENNSALT'S Ferric Chloride in sewage disposal operations simplifies and improves performance. It provides immediate filtration without the usual losses in sedimentation time in the treatment of fresh or digested sludge. Increases filter efficiency and multiplies vacuum-filter capacities through superior coagulation. Available in non-returnable steel drums of 135 and 350 lbs.

PENNSALT OF WASHINGTON DIVISION
PENNSALT CHEMICALS CORPORATION
TACOMA 1, WASHINGTON
OFFICES AND PLANTS:
Los Angeles & Menlo Park, Calif. Philadelphia, Pa. Portland, Ore.
Vancouver, B.C. (CRestwood 8-1412)

Pennsalt Chemicals
ESTABLISHED 1850

Laboratory Work Surfaces

419

Kewaunee Mfg. Co., Adrian, Mich., has published an 8 page booklet on "Kemrock, The Superior Laboratory Working Surface."

Included in the booklet is the story of what Kemrock is, how and why it was developed, and a pictorial story of how it is produced. The booklet also describes the essentials of heavy-duty laboratory work tops, and gives chemical and physical test data for Kemrock.

Spectrophotometers

420

Beckman/Scientific and Process Instruments Division. Fullerton, Calif., has released a brochure illustrating performance and versatility features of the Beckman DK Double-Beam Ratio Recording Spectrophotometers.

The 12-page brochure also lists specifications. Operating convenience features, applications data, and accessories for the Beckman DK-1 and DK-2 Spectrophotometers.

Troublesome pH Measurements

421

Beckman/Scientific and Process Instruments Div., Fullerton, Calif., has available a new data sheet presenting techniques for making accurate pH measurements in usually troublesome samples such as soils, emulsions, suspensions and oils.

Proper care of pH electrodes is discussed and step-by-step procedures are detailed for pH measurements in

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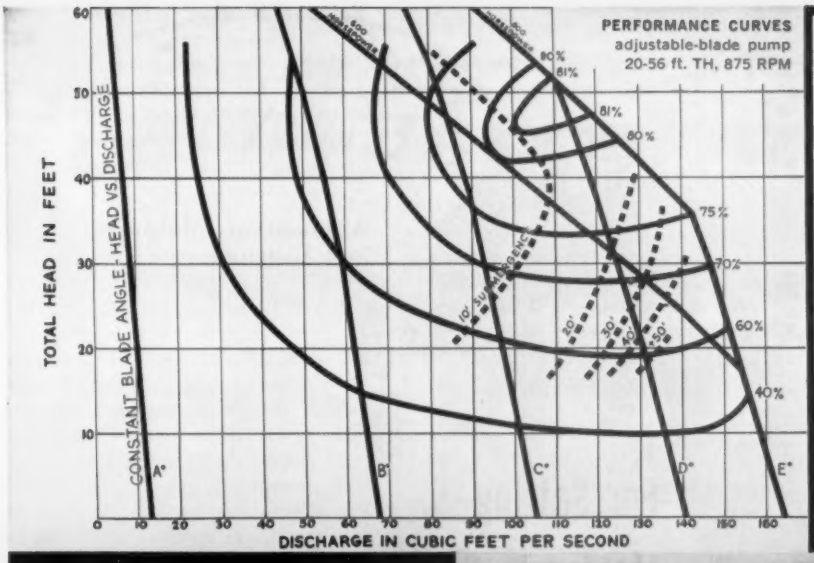
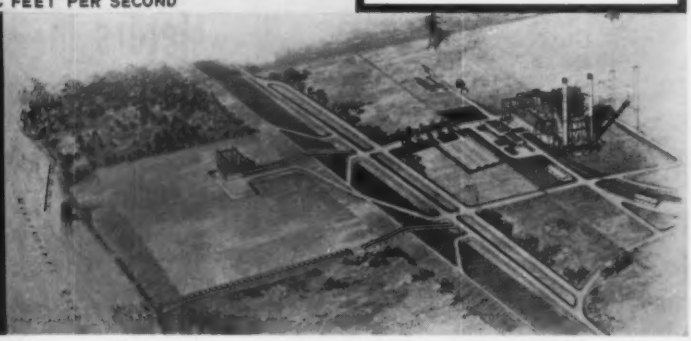


Performance curves of the A-C adjustable-blade axial flow pumps for Willow Glen illustrate their extreme flexibility. Pump operation is not restricted to a single head-discharge curve as is the case with fixed-blade pumps, but provides any discharge and head combination within the limits of motor horsepower and proper submergence.



Stone & Webster Engineering Corp. is designing and constructing the Willow Glen Plant at St. Gabriel, La. on the Mississippi River for Gulf States Utilities Co.

Flexibility and efficiency make Allis-Chalmers adjustable-blade pumps choice for Willow Glen

Two 30-inch Allis-Chalmers adjustable-blade axial flow pumps will be installed to provide condenser water for Unit #1 at the new Willow Glen Power Station. To meet requirements at minimum river level, with water temperatures that vary between 39°F and 90°F, the pumps are designed to deliver a total of 76,000 gpm against a 54-foot total head.

Extreme variation of suction pool elevation and the flexible condenser operation required for this station made adjustable-blade pumps the logical and economical choice. A-C adjustable-blade pumps attain relatively high efficiencies over a wide discharge and head range. This is accomplished by varying the pitch of the impeller blades while the pump is operating at constant speed. This adjustability keeps pumping costs at a minimum by combining low starting torque with high average efficiency.

Pump Bulletin 165 will give you complete information on high capacity axial flow pumps. To get your copy, write to Allis-Chalmers Manufacturing Co., Hydraulic Division, York, Penna.

Hydraulic Division RESEARCH | DESIGN | HYDRODYNAMICS | ENGINEERING | FABRICATION

Hydraulic Turbines & Accessories • Pumps • Liquid Heaters

Rotovalves • Ball Valves • Butterfly Valves • Free-Discharge Valves

A-C ALLIS-CHALMERS

New Bulletins

CONTINUED FROM PAGE 98A

dry, porous samples, oils and other water insoluable liquids, slurries, sludges, and viscous, colloidal and highly concentrated samples. Three separate procedures are outlined for proper soil pH measurements.

Rotary Blowers

422

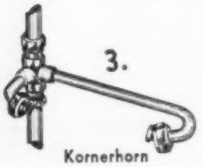
Roots-Connersville Blower, Div. of Dresser Industries, Inc., Connersville, Ind., has just issued a new, revised edition of a bulletin covering R-C Type AF rotary positive blowers. The 8-page bulletin has been brought completely up-to-date to include new capacities and pressure ratings. Detailed design and construction information is presented together with all essential application of this equipment in a wide range of process industries, for either vacuum or pressure.

For Setting Meters in Basements

EASY TO INSTALL

1. Cut supply line. Clamp not necessary but convenient

2. Add Connections



3. Kornerhorn in place

The KORNERHORN

In a vertical basement pipe, against the wall or in a corner, the Kornerhorn makes a most satisfactory meter setting. Installation is fast and economical as pipe threading is eliminated. Send for detailed information.

When Valves are Needed

Ford Kornerhorn valves installed on the supply side, or on both sides of the Kornerhorn add extra convenience and cleanliness when meters are changed.

THE FORD METER BOX COMPANY, INC.
FOR BETTER WATER SERVICES
Wabash, Indiana
FORD

Sewage Sludge Disposal

423

Combustion Engineering, Inc., Chicago, Ill., has available a 28-page, 2-color booklet in the C-E Raymond Flash Drying and Incineration System for Sewage Sludge Disposal.

Automation Equipment and Instruments

424

B-I-F Industries, Inc., Providence, R. I., has published a new 8-page, 2-color bulletin that describes representative items from the company's wide line of process instrumentation and equipment. The bulletin contains photographs, operational data, and design feature description of twelve varied products for positive control of materials in motion.

Vibrating Feeders Catalog

425

Syntron Co., Homer City, Pa., has announced publication of a new 30-page catalog on their standard and special model electromagnetic vibrating feeders for hard-to-handle bulk materials.

Centrifugal Pumps

426

Goulds Pumps, Inc., Seneca Falls, N. Y., has just issued a bulletin describing their line of single stage double suction centrifugal pumps with horizontally split cases. The bulletin states that in addition to the wide range of capacities and pressures, a high degree of standardization and interchangeability of parts distinguishes these pumps. This means minimum inventory of spare parts, flexibility of changes in the field to meet new requirements and low initial cost.

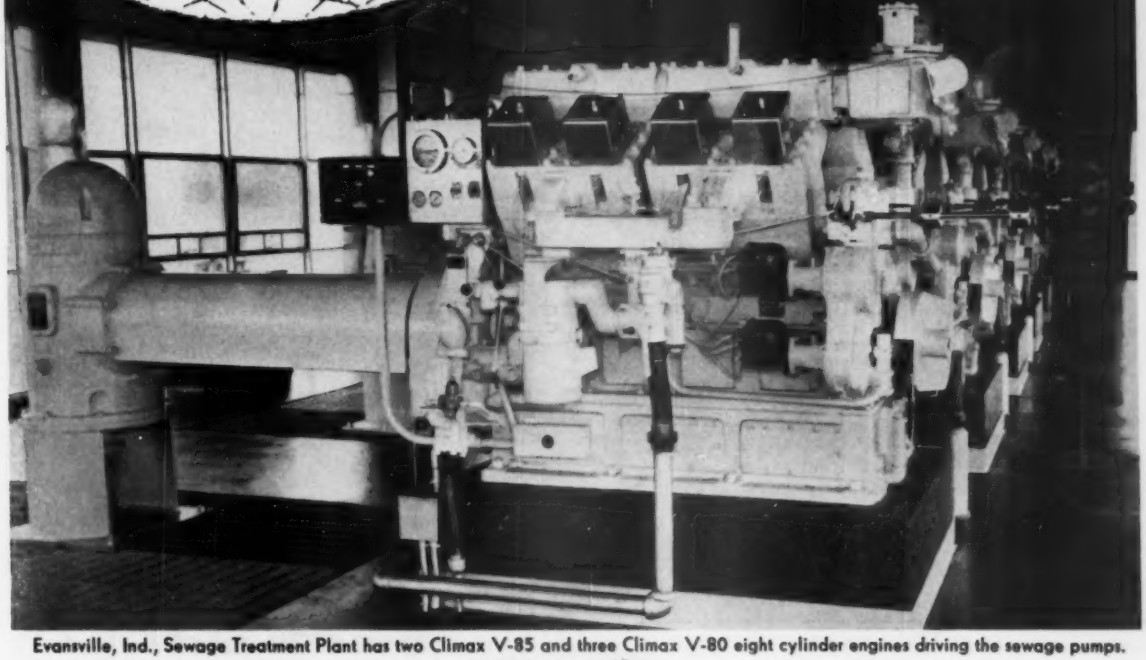
Sludge Aerator

427

Dorr-Oliver Inc., Stamford, Conn., has just published a new, four page, two color bulletin on the D.O Aerator. This bulletin describes the development, design and advantages of this improved method for supplying oxygen demands in the activated sludge process. Also included in the bulletin are cutaway wash drawings of typical aerator installations and an activated sludge flowsheet showing how the unit is employed.

CONTINUED ON PAGE 102A

EVERYWHERE in Sewage Treatment Plants



Evansville, Ind., Sewage Treatment Plant has two Climax V-85 and three Climax V-80 eight cylinder engines driving the sewage pumps.

CLIMAX ENGINES POWER the PUMPS

• Driving the Evansville, Indiana, sewage treatment plant's Worthington vertical sewage pumps through right angle gears at 720 rpm, 70 lb. BMEP, are five Climax eight-cylinder, 60-degree V-type sewage-natural gas engines. Two are 2474 cubic inch Climax V-85 model, 7⅛-in. bore x 7-in. stroke; and three are 2155 cubic inch Climax V-80 model, 7-in. bore x 7-in. stroke. Equipment includes dual ignition, air starting, Viking pump, Sarco blender, oil bath air cleaner, Honan Crane oil purifier, Synchro-Start ALS control and automatic fuel switchover.

The unusual compactness of Climax V-8 design means more power packed into less space. Rugged too, for durability with dependability in continuous duty sewage plant service.

Fuel economy is built-in. All the Climax plus-value operational features are described in Bulletin SA-584—send for it.

CLIMAX ENGINE MANUFACTURING CO.
FACTORY—CLINTON, IOWA

DIVISION OF WAUKESHA MOTOR COMPANY

CL-102

New Bulletins

CONTINUED FROM PAGE 100A

Rotameters For Flow Measurement

428

Schutte and Koerting Co., Cornwells Heights, Pa., has just released a bulletin describing the company's line of Laboratory Rotameters for measuring fluid rate of flow. Flexible connections are provided on these Rotameters for quick, easy installation in plastic, glass, or metal piping from ¼ inch through 2 inch sizes.

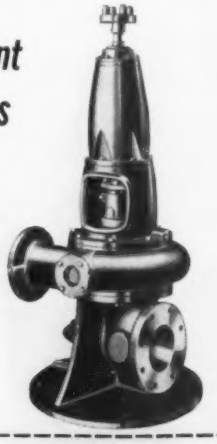
Digester Gas Metering

429

B-I-F Industries Inc., Providence, R. I., has published a 4-page, 2-color bulletin titled "Ten Reasons Why Your Digester Gas Meter Should be a Shuntflo Meter."

What to look for when you want low-maintenance sewage pumps

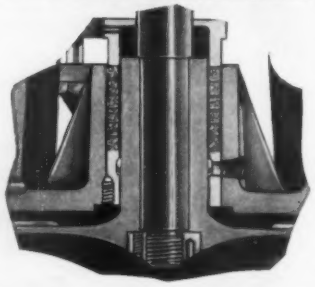
Wheeler-Economy, with half a century experience in the field, finds these are important features:



1. CLEAR, UNOBSTRUCTED, CAREFULLY DESIGNED WATERWAYS allow your pumps to pass exceptionally large rags, sticks, stones and solids without clogging. This 12″ x 10″ Wheeler-Economy Non-Clog Pump, for example, handles 7″ solids easily.

2. NON-CLOG IMPELLERS reduce maintenance, too. This W-E Impeller, a two-blade, wide-waterway type, is locked to shaft with countersunk nut to prevent accumulation of rags, string, etc. Scraper blades are on back to prevent binding.

3. RENEWABLE BRONZE SHOCK ABSORBER prevents shaft deflection as stones or other objects enter impeller. When abrasive material is being handled, clear water connection minimizes wear on shock bearing, shaft sleeve and packing.



LIKE MORE INFORMATION? Ask for Catalog F-100, F-101 and 102, and E-101 describing Wheeler-Economy's complete line of sewage pumps. No obligation.

Economy Pump Division

C. H. WHEELER MFG. CO.

19th and Lehigh Avenue • Philadelphia 32, Pa.

Whenever you see the name C. H. Wheeler on a product, you know it's a quality product

Centrifugal, Axial and Mixed Flow Pumps • Steam Condensers • Steam Jet Vacuum Equipment • Marine Auxiliary Machinery • Nuclear Products

Surface Wash Water Valves

430

Golden Anderson Valve Specialty Co., Pittsburgh, Pa., has just published a new 4 page technical bulletin describing Surface Wash Water Valves for Filters.

Process Equipment

431

Hardinge Co. Inc., York, Pa., has just published an 8 page brochure on its complete line of process equipment for mining, chemical, stone, ceramics, water, sewage and industrial waste applications.

Submersible Pumps

432

Stenberg Mfg. Corp., Hoosick Falls, N. Y., has published a bulletin describing their portable, fully submersible electric pumps for mining, contracting and general industry use.

Tank Capacity Slide Rule Calculator

433

Hammond Iron Works, Warren, Pa., has available a handy, pocket size slide rule calculator for determining capacity and size of storage tanks.

Ion Exchanger Handbook

434

National Aluminate Corp., Ion Exchange Div., Chicago, Ill., has just published a bulletin entitled "Water Conditioning with Nalcite Ion Exchanger." This new 60 page handbook explains the ion exchange method of water conditioning.

Concrete Tanks for Water and Sewage Treatment

435

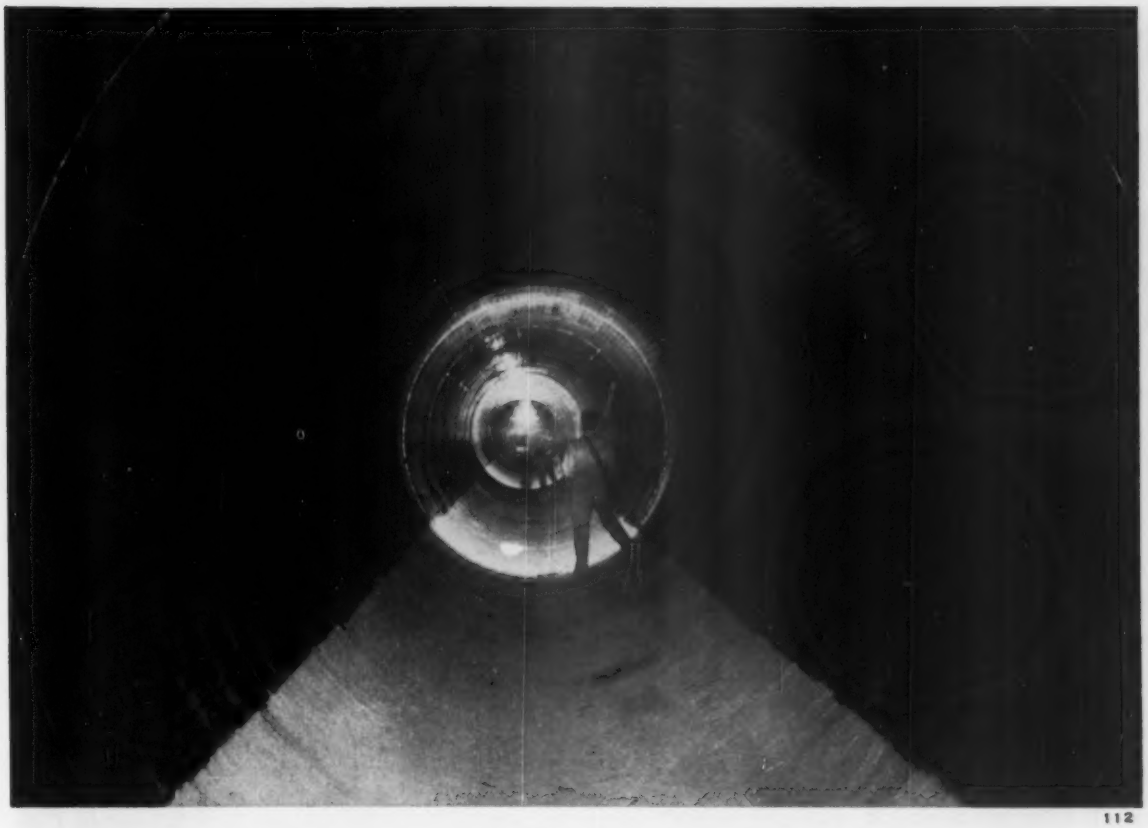
The Preload Co., Inc., New York, N. Y., has just released a bulletin that covers the history of pre-stressed concrete tanks in U. S. A. and abroad with a description of several recent record breaking storage tanks.

Valve-Regulator Maintenance Manual

436

Rockwell Mfg. Company's Meter and Valve Division, Pittsburgh, Pa., has announced that complete installation, operation and maintenance instructions for Rockwell-Nordstrom valve-regulators are described in a new 16 page photo-illustrated manual.

CONTINUED ON PAGE 104A



112

This Sewer will go a Long Way

Not only will this 9¾-foot outfall sewer extend eight miles, but it will go a long way in years of trouble-free service. The engineers who designed it say that it will still be functioning perfectly in the year 2000.

Their confidence is based on wise choice of construction materials. Every joint of pipe, every foot of monolithic tunnel, every structure is built of reinforced concrete to obtain structural strength at low cost. Every surface above the low flow line is completely covered by a continuous membrane of T-Lock Amer-Plate®, the vinyl lining that is impervious to the corrosive action of oxidized hydrogen sulfide *at any level of concentration.*

The engineers know that no one can accurately predict future rates of H_2S gas generation, so they have insured the ultimate life of the concrete by investing an extra 8 to 10% for T-Lock protection. They predict that this "extra" will spare their city the cost of a replacement sewer in about 20 years, and *save the taxpayers millions of dollars!*

Because of obvious and substantial savings such as this, millions of square feet of T-Lock are now in use in progressive municipalities from coast to coast. These include Los Angeles; Topeka; Wichita; Sioux Falls; Shreveport; Washington, D.C.; San Diego; Mansfield, Ohio; Huntington, W.Va.; Hutchinson, Kan.; and Orange County, Calif. T-Lock Amer-Plate is also on current specifications for many other municipalities. For complete list of users and specifiers, plus technical data and a typical specification, write:

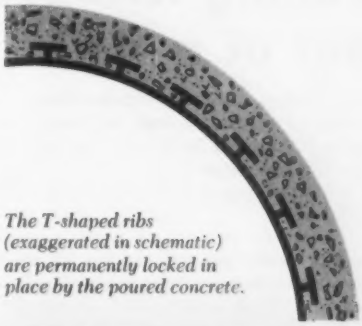
Amercoat® CORPORATION

Dept. WD

4809 Firestone Blvd.

South Gate, California

Evanston, Ill. • Kenilworth, N.J. • Jacksonville, Fla. • Houston, Texas



The T-shaped ribs (exaggerated in schematic) are permanently locked in place by the poured concrete.

There is no limitation on size or shape of structures which may be protected with T-Lock Amer-Plate.

New Bulletins

CONTINUED FROM PAGE 102A

Control Valves

437

Conoflow Corp., Philadelphia, Pa., has just issued a new bulletin describing the company's complete line of Series LB Control Valves.

Low Pressure Compressors

438

Joy Manufacturing Co., Pittsburgh, Pa., has just published a new eight page bulletin covering the company's complete line of heavy duty, low pressure compressors.

F&P "Quick Shipment" Catalog & Price List

439

Fischer & Porter Co., Hatboro, Pa., has just published a 52 page catalog on process instruments available for quick shipment.

pH Measurement Techniques

440

Beckman Scientific and Process Instruments Div., Fullerton, Calif., has released a new data sheet that presents techniques for making accurate pH measurements in usually troublesome samples such as soils, emulsions, suspensions and oils.

Water Requirements For Nuclear Plants

441

Graver Water Conditioning Co., New York, N. Y., has available a reprint of the article, "Ultra Pure Water—Prime Requisite for Nuclear Power Plant Cycles."

Submersible Pumps

442

Sumo Pumps Inc., Stamford, Conn., has just published a 4-page bulletin describing a wider range of 4-inch submersible pumps featuring new ratings and new performances.

Shaft-Mounted Speed Reducer

443

Link-Belt Company, Chicago, Ill., has issued a new 24 page book describing its completely new line of shaft-mounted speed reducers.

Well Screen Pipe

444

Emsco Screen Pipe Co., Houston, Texas, has just published a new eight page catalog describing Screen Pipe for oil, gas and water wells, including the "More Area" Slotted Screen Pipe, Vertical Slotted and Drilled Hole Wire Wrapped Screen, and Prepacked Gravel Pack Screen, together with specifications of various types.

Large Diameter Clay Pipe

445

Robinson Clay Products Co., Akron, Ohio, has just published an illustrated 4 page folder that describes the complete line of large diameter clay pipe and fittings.

CONTINUED ON PAGE 106A

Pulling RABBITS out of a HAT

It is obvious that water rates should be sufficient to finance maintenance, operations and necessary new construction. But water rates in America have been too low for over 75 years. The average paid by American water consumers for all water used is a little over 2 cents per day or 5 cents per ton. Water is the cheapest necessity you buy.

There are now many water distribution systems too small to supply peak demands of the growing communities they service, because they have been unable to finance new construction out of revenue. With a 65 to 70% potential increase in water consumption now predicted by 1975, the problem daily becomes more serious and water works improvements and extensions are needed on an increasing scale.

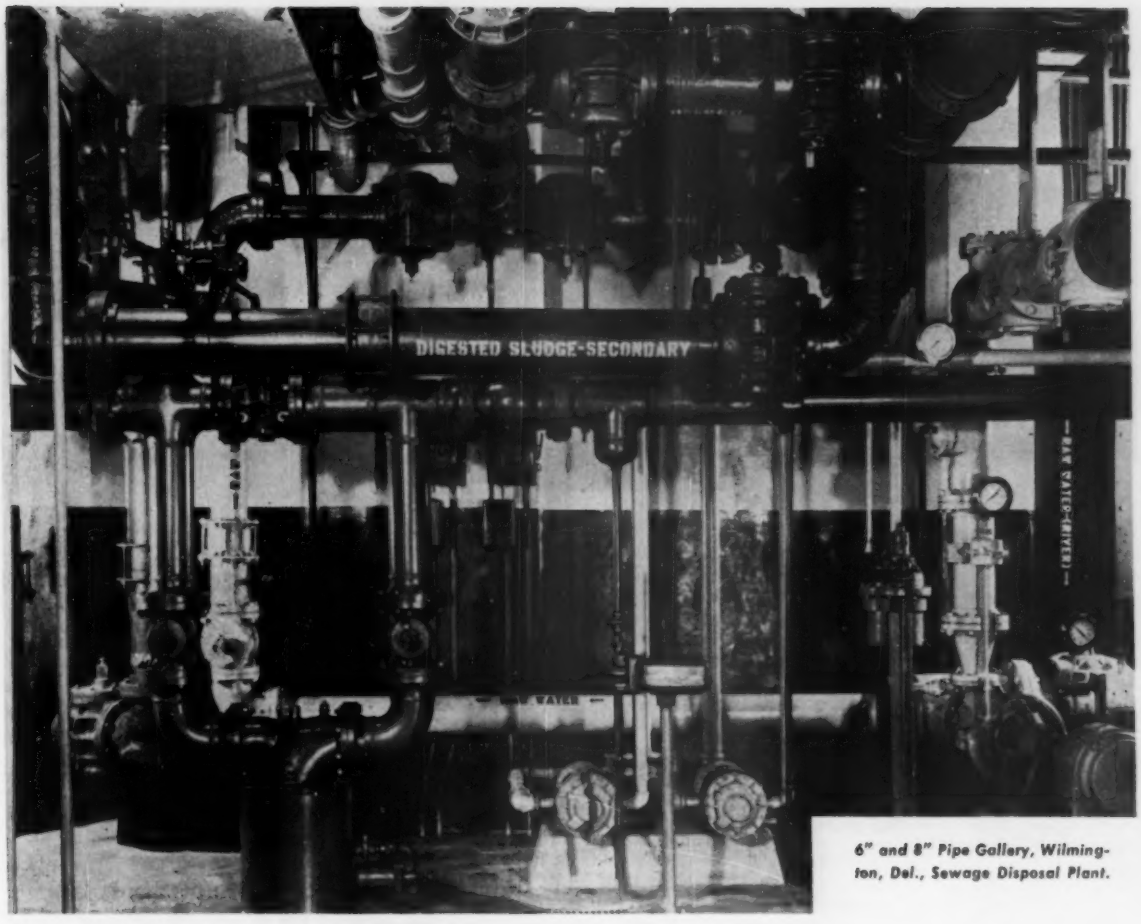
A magician may really appear to pull a rabbit out of his hat. But you can not expect your water works Superintendent to secure in that manner increased water supply, treatment, and distribution. To serve you better, he needs your help.

This Series is an attempt to put into words some appreciation of the water works men of the United States.

M&H VALVE AND FITTINGS COMPANY
ANNISTON, ALABAMA
SUBSIDIARY OF WALWORTH

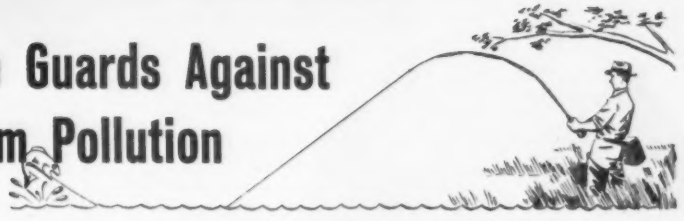
WANTED

Sanitary chemists, bacteriologist and laboratory assistants for new Sewage Treatment Plant located in Western Pennsylvania. Salary open. Please send complete resume. Write Box 5000, Water & Sewage Works, 185 No. Wabash Ave., Chicago 1, Illinois.



6" and 8" Pipe Gallery, Wilmington, Del., Sewage Disposal Plant.

Cast Iron Pipe Guards Against Stream Pollution



Every 12 hours a contract is let for a new sewage treatment works to clean up America's waterways and protect the public health.

Into these plants go thousands of tons of enduring cast iron pipe and fittings. Engineers designing these plants know that no other pipe material compares with cast iron in withstanding the corrosive effects of strong sewage, acids and treatment chemicals. And none has equal strength or a matching time-proved record of long life and low cost service.

Engineers also specify large cast iron pipe for sewer force mains to operate under pressure where strength, longevity and a minimum of jointings are a vital factor. So cast iron pipe not only serves to bring water to our cities and towns but takes it away for cleansing treatment and returns it pure for use again.

Our Company does not manufacture cast iron pipe but supplies many of the nation's leading foundries with quality pig iron from which quality pipe is made.

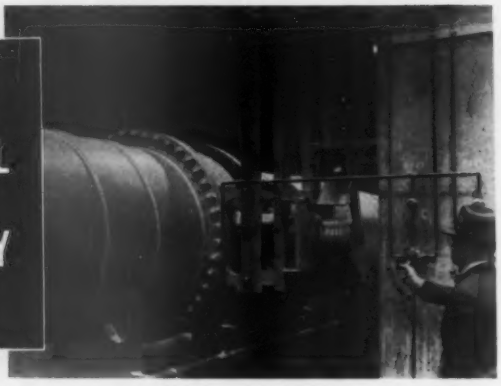
WOODWARD IRON COMPANY

Since 1882

WOODWARD, ALABAMA

at the Massena, N. Y., intake of the St. Lawrence Project

they've installed ROCKWELL AWWA BUTTERFLY VALVES



Yes, five 48" diameter Rockwell valves passing some 40 million gallons of water daily. Two of these valves at the canal intake are equipped with extended stems and worm gear handwheel units for remote control; the three valves in the power plant are equipped with hydraulic cylinders and 4-way control valves. All have Rockwell's exclusive Wedge-Lock rubber seat insert for drip-tight shutoff.

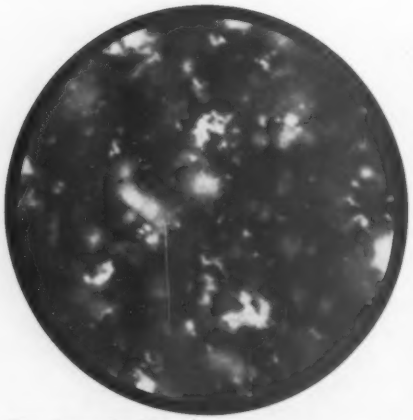
There are many such successful Rockwell valve installations for water applications. Bulletin 581 tells why.

ROCKWELL SINCE 1888 BUILT

W. S. ROCKWELL COMPANY

Valves—Butterfly · Slide · Diaphragm · Special

2829 ELIOT STREET • FAIRFIELD, CONN.



Floc formed with aid of activated silica sol

HOW BIG IS YOUR FLOC?

It's snowflake size when you coagulate with the aid of N-Sol activated silica. The larger, heavier floc enmeshes more impurities and suspended matter, which settle rapidly, producing sparkling clear water.

N-Sol is conveniently made in your plant with N sodium silicate and a reacting chemical. Let us send you a sample of N silicate with directions for jar tests.

PQ SOLUBLE SILICATES

PHILADELPHIA QUARTZ CO.

1166 Public Ledger Bldg., Philadelphia 6, Pa.

Trademarks Reg. U.S. Pat. Off.

New Bulletins

CONTINUED FROM PAGE 104A

Sea Water Evaporators

446

The Maxim Silencer Co. Subsidiary, Emhart Mfg. Co., Hartford, Conn., has available a plastic-bound, profusely-illustrated, 24-page booklet, entitled "Fresh Water Unlimited."

Slide Selector For Liquid Level Gages and Valves

447

Jerguson Gage & Valve Co., Burlington, Mass., has announced a new Slide Selector for easy selection of the correct size and type of liquid level gages and valves for any job.

Oster Pipe Machine Film

448

The Oster Mfg. Co., Wickliffe, Ohio, has just released a new 16 mm full color, sound film entitled "Breaking the Price Barrier."

The film features Oster's new, low cost "100" Power Drive and highlights the time, cost and work-saving advantages from its use—both in the shop and on the job. Anyone having anything to do with threading of pipe or conduit will find this movie both interesting and informative.

C. B. & I. Services Booklet

449

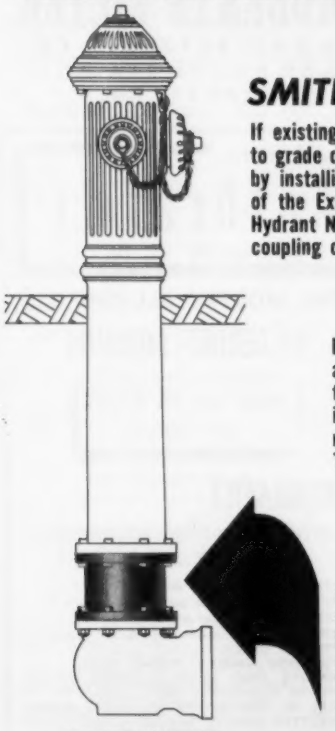
Chicago Bridge & Iron Co., Chicago, Ill., has available a 4-page booklet entitled, "Creative Craftsmanship in Steel." The booklet describes the coordination engineering, fabrication and erection services offered by the company.

CONTINUED ON PAGE 108A

WATER SUPERINTENDENT. The Village of La Grange, Illinois, is seeking applications for the position of Water Superintendent. Will have charge of complete water works system, including treatment and distribution. 3 MGD plant. Lime—soda ash—zeolite softening process. Salary open. Attractive fringe benefits. Apply submitting resumé of education and experience to Robert E. Meyer, Village Manager, La Grange, Illinois.

HERE IS HOW SMITH HYDRANTS CAN BE EXTENDED

If existing Fire Hydrant Nozzles and Caps are not readily accessible due to grade changes this condition can be quickly and economically corrected by installing Hydrant Standpipe Extensions as illustrated. The installation of the Extension will provide clearance between the groundline and the Hydrant Nozzles permitting the free rotation of the wrench and the quick coupling of fire hose to existing Hydrants.



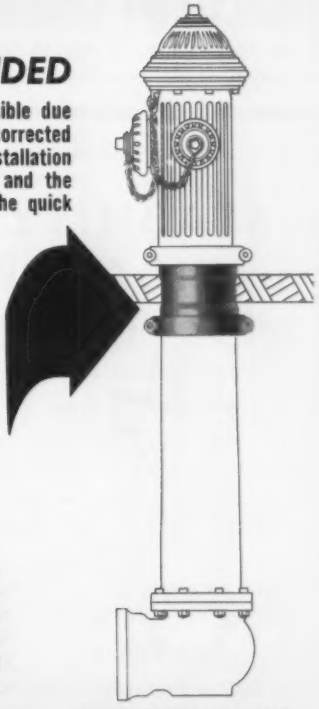
BY EXCAVATING

PROTECTOP HYDRANT

Depth of bury can be increased by installing Standpipe and Main Valve Rod Extensions at the groundline between the Upper and Lower Sections. This construction permits installation of the Extension without excavating and the reuse of the original Hydrant internal operating parts. The Extensions are produced in 6″ increments.

ONE PIECE STANDPIPE OR TWO PART HYDRANT

After the Standpipe is excavated the extension is installed between the bottom of the Standpipe and the Hydrant Elbow. The depth of bury is increased by the desired amount reusing the original operating parts. The Extension thread accepts the original Main Valve Rod assembly. The Extensions are produced in 6″ increments.



WITHOUT EXCAVATING

FIRE HYDRANTS · VALVES · SINCE 1896

THE A.P. SMITH MFG. CO.

EAST ORANGE, NEW JERSEY

New Item . . .
RTM ROTO-TROL
Multi-Circuit Pump Controller

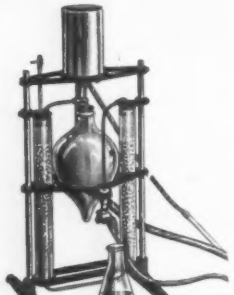
- Recording and Indication when Desired
- Suppressed Head Type
- Any Distance between Transmitter & Receiver

The RTM Roto-Trol operates on the time impulse principle. A tested and proved switching mechanism is operated by a powerful dual motor drive. The motor starters can be controlled direct from the heavy duty mercury switches.

Write for New Bulletin RTM

HEALY-RUFF Company
783 Hampden Ave., St. Paul 14, Minn.

ENSLOW
STABILITY INDICATOR



For checking the equilibrium of a finished water, and supplying an index useful in controlling anti-corrosion treatment. Catalog No. 83-895

WRITE:

Phipps & Bird, Inc.
P. O. Box 2V Richmond 5, Va.

New Bulletins

CONTINUED FROM 106A

Controlled Volume Pumps

450

Milton Roy Co., Philadelphia, Pa., has just published a Bulletin describing the new line of Milroyal controlled volume pumps with totally enclosed drives. This bulletin describes the design features of the pumps and tell how they work as well as providing specifications.

Tunnel Liner Plates

451

Commercial Shearing & Stamping Company, Youngstown, Ohio, has available a new 20-page publication that covers steel tunnel liner plates.

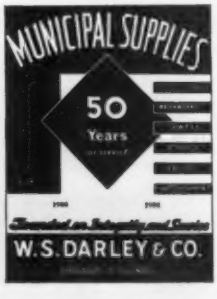
Gratings Manual

452

Klemp Metal Grating Corporation, Chicago, Ill., has just published a new 20 page "Data and Specification" Manual designed for the permanent libraries of architects, engineers and plant supervisors.

POSITION AVAILABLE
MAY 1, 1959

"Sewage Treatment Plant superintendent for newly constructed 3.0 M.G.D. activated sludge treatment plant with separate sludge digestion and sludge drying beds located near Pittsburgh, Pa. Previous experience in activated sludge plant operation required. Starting salary range: $7,200 to $7,500 per year. Send resume containing personal history experience and educational record to box number 5002.



Write Today For 100 Page Catalog
W. S. DARLEY & CO. Chicago 12

Synonym for...

PURE WATER

ROBERTS FILTER
MANUFACTURING CO.
607 COLUMBIA AVE.
DARBY, PA.

switch to
Anthrafilt
Trade Mark Reg. U.S. Pat. off.

THE MODERN ALL-PURPOSE
FILTERING MEDIUM

Best for All Types of Filters

ANTHRAFILT
offers important advantages over sand and quarts

DOUBLES length of filter runs.
REQUIRES only half as much wash water.
KEEPS filters in service over longer periods.
INCREASES filter output with better quality effluent.
GIVES better support to synthetic resins.
PROVIDES better removal of fibrous materials, bacteria, micro-organic matter, taste, order, etc.
IDEAL for industrial acid and alkaline solutions.
EFFECTIVE filtration from entire bed.
LESS coating, caking or balling with mud, lime, iron or manganese.

Write for further information, test samples and quotations to:

PALMER FILTER EQUIPMENT CO.
P. O. Box 1696—822 E. 8th St., Erie, Pa.

Representing
ANTHRACITE EQUIPMENT CORP.
Anthracite Institute Bldg.,
Wilkes-Barre, Pa.

Consulting Engineers *IN WATER & SEWAGE WORKS*

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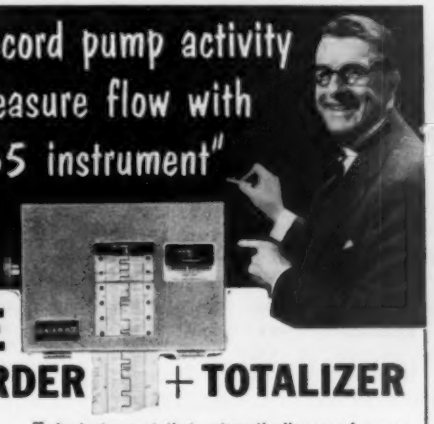

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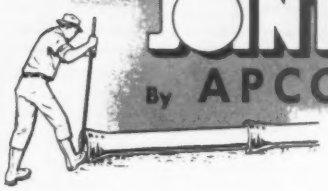

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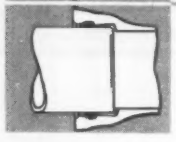

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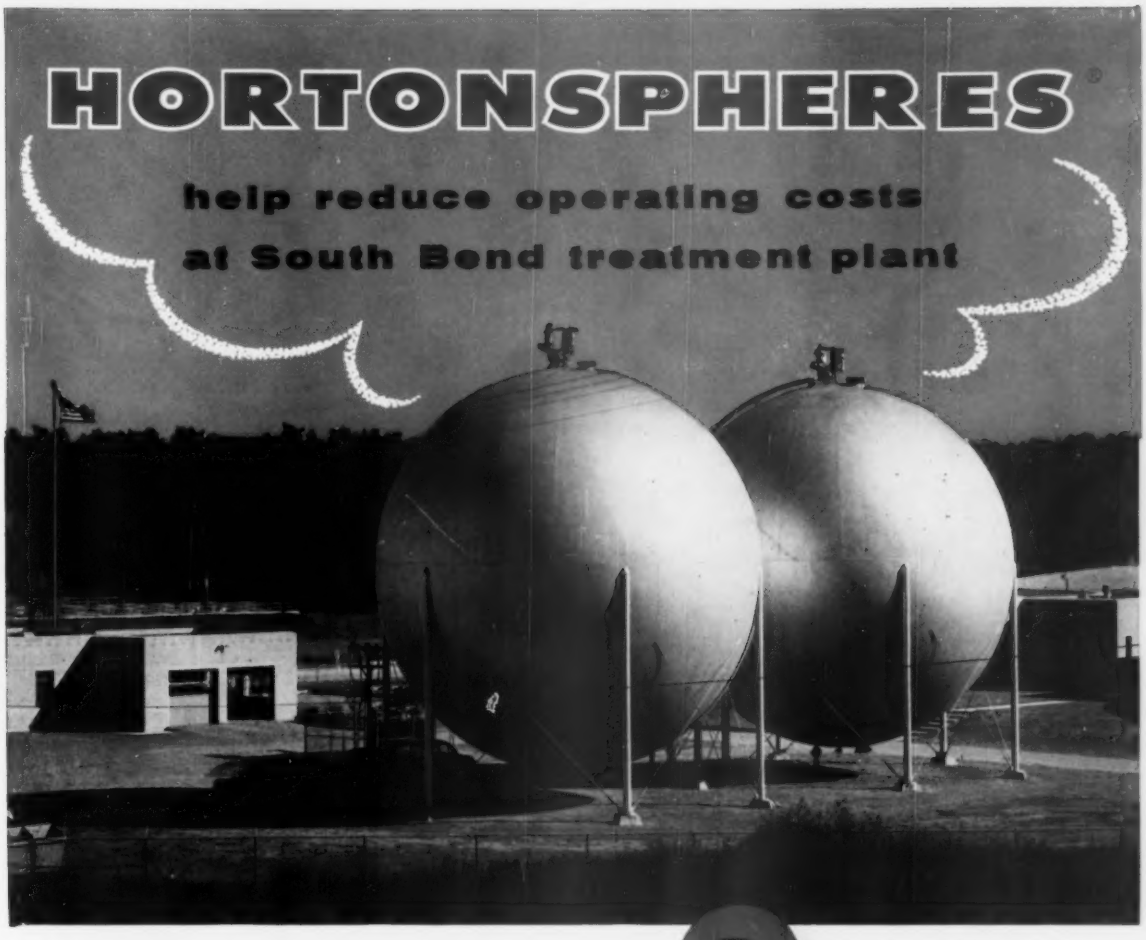

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